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Major Mark Richter
Project Manager/COR
AFCEE
Unit 14007
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10 April 2008

SUBJECT: Final Record of Decision for Sites 4, 11, 25, 28, and 34, Main Base Operable Unit, Andersen Air Force Base, Guam.

PROJECT: Andersen AFB, Contract No. F41624-03-D-8596-0037 (Task Order 37)
Project No. AJJY20057001S4 (CDRL A001)

Dear Major Richter:

Enclosed is one (1) electronic copy of the *Final Record of Decision for Sites 4, 11, 25, 28, and 34, Main Base Operable Unit, Andersen Air Force Base, Guam.* This document was prepared in accordance with the Statement of Work for the above referenced task order. One (1) electronic copy for Ms. Cathy Dolan and one (1) electronic copy for Mr. Brian Thomas are being forwarded to Booz Allen Hamilton. Seven (7) copies for Andersen AFB (including two (2) copies for the information repositories and one (1) copy for the administrative record) are being hand-delivered to Mr. Gregg Ikehara. Two (2) copies of the completed signature pages for USEPA and two (2) copies of the completed signature pages for Guam EPA are being hand-delivered to Mr. Gregg Ikehara. A copy of this transmittal (w/o enclosures) will also be forwarded to AFCEE/MSCD.

If you have any questions or comments, please contact me at your convenience. We appreciate the opportunity to provide these services to AFCEE.

Sincerely,

for

Joel J. Lazzeri, P.G.
V.P. Federal Programs

cc: Mr. Gregg Ikehara, 36 CES/CEVR, Andersen AFB (7 copies)
Ms. Cathy Dolan, Booz Allen Hamilton (1 electronic copy)
Mr. Brian Thomas, Booz Allen Hamilton (1 electronic copy)
Mr. Mark Ripperda, USEPA Region 9 (2 copies signature page only)
Mr. Michael Cruz, Guam EPA (2 copies signature page only)
Mr. Scott Moncrief, P.G., EA–Hawaii (1 electronic copy)
Mr. Joel Lazzeri, P.G., EA–Corporate (1 electronic copy)
Mr. Toraj Ghofrani, P.E., EA–Guam (1 electronic copy)
AFCEE/MSCD (w/o enclosures)
AFCEE Project File, EA-Guam (1 electronic copy)

Checklist for Records of Decision
(AFLSA/JACE Draft 1, 07Feb2005)

***Final Record of Decision for Sites 4, 11, 25, 28, and 34, Main Base Operable Unit, Andersen Air Force Base, Guam* (August 2007)**

Sources

- CERCLA: 42 USC §§ 9617(b) and 9621
- NCP: 40 CFR § 300.430(f)(5)
- OSWER # 9200.1-23P, *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents,* July 1999, chapter 6
- SAF/IE 7Oct2003 *Air Force Policy on Performance-Based Records of Decision (RODs) for Land Use Control (LUC) Implementation*
- SAF/IEE 27Oct2004 *Air Force Cleanup Program Performance-Based Management Policy*

Site 4	Site 11	Site 25	Site 28	Site 34	
Statutory Requirements					
NA 2.9	NA 2.9	NA 2.9	NA 2.9	NA 2.9	Discussion of any significant changes from proposed plan and reasons for
Yes 3	Yes 3	Yes 3	Yes 3	Yes 3	Response to each significant comment, criticism and new data submitted regarding proposed plan
Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Must publish notice of ROD and make publicly available before commencing remedial action
NA 2.7.6	NA 2.7.6	NA 2.7.6	NA 2.7.6	NA 2.7.6	Must determine action is necessary to be carried out to protect public health or welfare or the environment
NA	NA	NA	NA	NA	Remedy must be cost-effective, taking into account short- and long-term costs, including operation and maintenance, for the entire period of remedy
NA	NA	NA	NA	NA	Remedy meets preference to have as principal element treatment that permanently and significantly reduces the volume, toxicity or mobility, or explain why not
NA	NA	NA	NA	NA	Offsite transfer and disposal without such treatment least favored alternative where practicable treatment technology available

Site 4	Site 11	Site 25	Site 28	Site 34	
NA	NA	NA	NA	NA	Remedy selected must utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable
NA	NA	NA	NA	NA	Remedy must be protective of human health and the environment, both as to degree of cleanup and control of further releases
NA	NA	NA	NA	NA	For hazardous substances left onsite, meet ARARs or specify findings for waiver
NA	NA	NA	NA	NA	No permits required for onsite response actions
NA	NA	NA	NA	NA	Actions selected to be in accordance with the NCP to the extent practicable
NCP Requirements					
Yes 1.2 and 1.6	Yes 1.2 and 1.6	Yes 1.2 and 1.6	Yes 1.2 and 1.6	Yes 1.2 and 1.6	If NPL facility, EPA must agree with remedy selection
Yes 2.1, 2.2, 2.5, 2.6, and 2.7.1	Yes 2.1, 2.2, 2.5, 2.6, and 2.7.2	Yes 2.1, 2.2, 2.5, 2.6, and 2.7.3	Yes 2.1, 2.2, 2.5, 2.6, and 2.7.4	Yes 2.1, 2.2, 2.5, 2.6, and 2.7.5	Document all facts, analyses of facts and site-specific policy determinations considered, "..as appropriate, and in a level of detail appropriate to the site…"
NA	NA	NA	NA	NA	Must explain how the nine remedy selection criteria of § 300.430(e)(9)(ii) utilized to select remedy
NA	NA	NA	NA	NA	• Protection of human health and the environment
NA	NA	NA	NA	NA	• Compliance with ARARs
NA	NA	NA	NA	NA	• Long-term protectiveness and permanence
NA	NA	NA	NA	NA	• Reduction of toxicity, mobility or volume through treatment
NA	NA	NA	NA	NA	• Short-term effectiveness
NA	NA	NA	NA	NA	• Implementability
NA	NA	NA	NA	NA	• Cost
NA	NA	NA	NA	NA	• State acceptance (and EPA and local agencies)
NA	NA	NA	NA	NA	• Community acceptance
NA	NA	NA	NA	NA	Must include no action alternative

Site 4	Site 11	Site 25	Site 28	Site 34	
NA	NA	NA	NA	NA	Describe how selected remedy is protective of human health and environment, explaining how it eliminates, reduces or controls human and environmental receptor exposure
NA	NA	NA	NA	NA	ARARs the remedy will achieve
NA	NA	NA	NA	NA	ARARs that will not be met, the specific waiver and justification for the waiver
NA	NA	NA	NA	NA	Explain how the remedy is cost-effective, by providing overall effectiveness proportional to cost
NA	NA	NA	NA	NA	Explain how the remedy utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent feasible
NA	NA	NA	NA	NA	Meets the preference for remedies employing treatment as a principal element to permanently and significantly reduce toxicity, mobility or volume, and if not, explain why not
NA	NA	NA	NA	NA	Identify, as appropriate, remediation goals the remedy is expected to achieve, for all contaminants, media and pathways of concern
NA	NA	NA	NA	NA	Identify appropriate media locations at which performance shall be measured, to include as appropriate engineering and institutional controls
NA	NA	NA	NA	NA	Describe if hazardous substances will remain on site above levels that would allow for unlimited use and unrestricted exposure, such that a five-year review is required
NA	NA	NA	NA	NA	If appropriate, commit to further analysis and long-term response measures within an appropriate time frame

Site 4	Site 11	Site 25	Site 28	Site 34	
NA 2.9	NA 2.9	NA 2.9	NA 2.9	NA 2.9	If the basic features of the remedy differ significantly from that presented in the proposed plan with respect to scope, performance or cost, discuss the changes and the reasons for the change if such changes could be reasonably anticipated (if not reasonably anticipated, need to revise proposed plan and new public comment period)
Yes 3	Yes 3	Yes 3	Yes 3	Yes 3	Respond to significant comments, criticisms and relevant new information submitted during public comment period (responsiveness summary)
Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Yes 2.3 and Appendix B	Publish notice of availability of ROD in a major local newspaper of general circulation and place in administrative record before the commencement of remedial action
Air Force Policy Requirements					
NA 2.8	NA 2.8	NA 2.8	NA 2.8	NA 2.8	Generic commitment for AF to implement, monitor, maintain and enforce remedies
NA	NA	NA	NA	NA	Remedial objectives, to include for LUCs if a remedial component
NA	NA	NA	NA	NA	Basic description of use and activity restrictions and a general description of the specific actions essential to carry them out. Normally this will include
NA	NA	NA	NA	NA	• Annotation in base master plan
NA	NA	NA	NA	NA	• Use of base construction review and dig permit systems
NA	NA	NA	NA	NA	• Fences and signs as appropriate
NA	NA	NA	NA	NA	Location of LUCs
NA	NA	NA	NA	NA	Duration of LUCs
NA	NA	NA	NA	NA	Entity(ies) responsible for LUCs
NA	NA	NA	NA	NA	Monitoring frequency of LUCs
NA	NA	NA	NA	NA	Periodic report of LUC monitoring to regulators on an informational basis only, with copies filed in administrative record and information repository

Site 4	Site 11	Site 25	Site 28	Site 34	
NA	NA	NA	NA	NA	Prompt notification to regulators of LUC deficiency/failure along with corrective measures taken or planned
NA	NA	NA	NA	NA	Regulator concurrence for significant changes to use and activity restrictions and LUCs
NA	NA	NA	NA	NA	Prior notification to regulators for transfer of property subject to LUCs
NA	NA	NA	NA	NA	Cleanup levels based on promulgated standards, or reliable toxicological data that reflect the most current and best science available
NA	NA	NA	NA	NA	Cleanup objectives and levels based upon current and reasonably anticipated (realistic) future land use and ground and surface water beneficial use designations, considering foreseeable mission needs
NA	NA	NA	NA	NA	Must do suitability analysis to determine if ARARs waiver available – if conditions for waiver met, AF/ILEV or AFRPA/DR written approval required

Note: Section numbers provided below response.
NA = not applicable

EPA OSWER Recommended Checklist: *Caveat: EPA guidance is not a source of legal requirements that fall within the CERCLA § 120 (a)(1) waiver of sovereign immunity. They do not constitute CERCLA implementing guidelines, rules regulations and criteria we must comply with under CERCLA § 120(a)(2). However, such guidance does represent years of accumulated experience and knowledge of both EPA, other regulators, and the regulated community, and provides a very helpful format to flush out and ensure the legal requirements above are met. Keep in mind that AF performance-based policy should be applied so that the document is streamlined, tailored, and performance oriented.*

Further remember that ROD is both a legal document upon which any legal review is based (42 USC § 9613(j)(1)) and the "playbook" upon which remedy execution and implementation is based. If the ROD is not written in a reasonably understandable and thorough manner, it can't meet these fundamental requirements. Addressing the matters identified in the EPA OSWER checklist will further help ensure the above identified legal requirements have been sufficiently addressed and reasonably explained.

The EPA checklist can be found at pages 6-59 through 6-54 in the above referenced OSWER.

THE UNITED STATES AIR FORCE

INSTALLATION RESTORATION PROGRAM

FINAL

RECORD OF DECISION
FOR
SITES 4, 11, 25, 28, AND 34
MAIN BASE OPERABLE UNIT

ANDERSEN AIR FORCE BASE, GUAM

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August 2007

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6. AUTHOR(S)

Scott Moncrief, P.G., Joel Lazzeri, P.G., Summer Barbina, Ginny Obert, and Chris VanWart

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

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P.O. Box 4355, Andersen AFB, Yigo, Guam 96929-4355

8. PERFORMING ORGANIZATION REPORT NUMBER

N/A

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)

Air Force Center for Engineering and the Environment
AFCEE/IWPH
Hickam AFB, HI 96853

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12a. DISTRIBUTION/AVAILABILITY STATEMENT

Approved for public release; distribution is unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT ***(Maximum 200 words)***

This Record of Decision (ROD) is prepared for Sites 4, 11, 25, 28, and 34, located in the Main Base Operable Unit at Andersen AFB, Guam. The sites are Installation Restoration Program (IRP) Site 4/Landfill 6 (Site 4), IRP Site 11/Landfills 15A and 15B (Site 11), IRP Site 25/Firefighter Training Area 1 (Site 25), IRP Site 28/Chemical Storage Area 1 (Site 28), and IRP Site 34/Polychlorinated Biphenyl Storage Area (Site 34). These sites are grouped together because they require a completed Remedial Investigation, Proposed Plan, and ROD to finalize their closure under CERCLA. This ROD presents the selected remedy for Sites 4, 11, 25, 28, and 34. In all cases, no additional action is proposed.

14. SUBJECT TERMS

- *Andersen AFB*
- *Installation Restoration Program*
- *Record of Decision*

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Acronyms and Abbreviations

AFB	Air Force Base
AR	Administrative Record
Battelle	Battelle Memorial Institute
bgs	below ground surface
BTV	Background Threshold Value
CDI	Chronic Daily Intake
CE	Civil Engineer
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DERP	Defense Environmental Restoration Program
DF	Direction Finding
DPDO	Defense Property Disposal Office
DRMO	Defense Reutilization Marketing Office
DSI	Detailed Site Inventory
EA	EA Engineering, Science, and Technology, Inc.
EE/CA	Engineering Evaluation/Cost Analysis
EPC	Exposure Point Concentration
EQDR	Explosive Quantity Distance Range
ERA	Ecological Risk Assessment
ESE	Environmental Science and Engineering, Inc.
°F	Degrees Fahrenheit
FFA	Federal Facility Agreement
FS	Feasibility Study
FTA	Firefighter Training Area
GTI	Groundwater Technologies Inc.
Guam EPA	Guam Environmental Protection Agency
HARM	Hazard Assessment Rating Methodology
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HQ	Hazard Quotient

ICF	ICF Technology, Inc.
ID	Identification
IRIS	Integrated Risk Information Systems
IRP	Installation Restoration Program
lcy	loose cubic yards
µg/L	micrograms per liter
MARBO	Marianas/Bonins Command
MCL	Maximum Contaminant Level
mg/kg	milligrams per kilogram
mph	miles per hour
msl	mean sea level
NCP	National Oil and Hazardous Substances Pollution Contingency Plan of 1990
NEPA	National Environmental Policy Act
NFRAP	No Further Response Action Planed
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
PRE	Preliminary Risk Evaluation
PRG	Preliminary Remedial Goal
RFA	RCRA Facility Assessment
RfD	Reference Dose
RG	Remedial Goal
RI	Remedial Investigation
RME	Reasonable Maximum Exposure
ROC	Receptor of Concern
ROD	Record of Decision
RVR	Remediation Verification Report
SAIC	Science Applications International Corporation
SARA	Superfund Amendments and Reauthorization Act of 1986
SF	Slope Factor
SVOC	Semivolatile Organic Compound
SWMU	Solid Waste Management Unit
TAL	Target Analyte List
TCE	trichloroethene
TSCA	Toxic Substances Control Act
UHF	Ultra High Frequency

USAF	United States Air Force
USEPA	United States Environmental Protection Agency
USN-PWC	United States Navy Public Work Center
VOC	Volatile Organic Compound
WSA	Weapons Storage Area

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1.0 Declaration

1.1 Site Name and Location

Facility Name: Andersen Air Force Base (AFB), Guam
Site Location: Yigo, Guam
Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) Identification (ID) Number: GU6571999519
Operable Unit/Site: Five Installation Restoration Program (IRP) sites located in the Main Base Operable Unit (OU) (Figures 1-1 and 1-2):

- IRP Site 4/Landfill 6 (Site 4)
- IRP Site 11/Landfills 15A and 15B (Site 11)
- IRP Site 25/Firefighter Training Area 1 (FTA-1) (Site 25)
- IRP Site 28/Chemical Storage Area 1 (Site 28)
- IRP Site 34/Polychlorinated Biphenyl (PCB) Storage Area 1 (Site 34)

1.2 Statement of Basis and Purpose

This decision document presents the selected remedies for the United States Air Force (USAF) IRP Sites 4, 11, 25, 28, and 34, at Andersen AFB, Yigo, Guam. The selected remedies were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record (AR) for these sites, including pertinent IRP documents, correspondence, and material related to the CERCLA investigations and cleanups.
This document is issued by the USAF, as the lead agency. The USAF is managing remediation of contamination at the Main Base OU sites listed above in accordance with CERCLA as required by the Defense Environmental Restoration Program (DERP). The USAF and the United States Environmental Protection Agency (USEPA) have jointly selected the remedies and the Guam Environmental Protection Agency (Guam EPA) has concurred with the decision, under the guidelines established in the Federal Facilities Agreement (FFA) signed in February 1993 by representatives of USEPA Region 9, Guam EPA, and the USAF (USEPA et al., 1993).

1.3 Description of Selected Remedy

Based on the results of previously conducted Remedial Investigations (RIs) (Sites 4, 11, 25, 28, and 34), an Engineering Evaluation/Cost Analysis (EE/CA) (Site 34), and subsequent removal actions (Sites 28 and 34), the USAF has determined that no further CERCLA remedial action is required at Sites 4, 11, 25, 28, or 34.

1.4 Statutory Determinations

This section describes how the selected remedies satisfy the statutory requirements of CERCLA §121 and the regulatory requirements of the NCP.

Because the Human Health Risk Assessment (HHRA) for Sites 4, 25, 28, and 34; Preliminary Risk Evaluation (PRE) for Site 11; and Ecological Risk Assessment (ERA) for Sites 4 and 28 indicate that there are no unacceptable risks to human or ecological receptors, or because the sites have been cleaned up so that residual contaminant concentrations are at levels that allow for unrestricted future use, the USAF has determined that no further CERCLA remedial action is necessary at Sites 4, 11, 25, 28, or 34.

Findings of previous site investigations at Sites 4, 11, 25, and 28 resulted in No Further Response Action Planned (NFRAP) recommendations for these sites. An EE/CA previously performed at Site 34 determined there were unacceptable risks due to onsite contamination that was attributed to prior USAF activities. The EE/CA established site-specific risk-based remedial goals (RGs) to reduce risks to acceptable levels. Subsequently, a non-time-critical removal action was successfully implemented at Site 34 to remove contaminants so as to reduce risk to acceptable levels. Therefore, no further action is required at any of these sites and current site conditions at each site would allow for unrestricted future use and unlimited access to the land.

Because there are currently no hazardous substances, pollutants, or contaminants remaining at the sites above levels that would restrict future use or limit access/exposure, a five-year review is not required.

1.5 Data Certification Checklist

The information included in the Decision Summary section (Section 2) of this Record of Decision (ROD) is summarized in Table 1-1. Additional information can be found in the AR file for Andersen AFB, Yigo, Guam, which is available for public review at the Robert F. Kennedy Library at the University of Guam and the Nieves M. Flores Memorial Library in Hagåtña. The AR file is also available on the following internet website: http://www.adminrec.com/PACAF.asp.

1.6 Authorizing Signatures

The following signature sheets document the USAF, USEPA Region 9, and Guam EPA approval of the no action decision selected in this ROD for Main Base OU Sites 4, 11, 25, 28, and 34, Andersen AFB, Yigo, Guam.

This signature page documents that the USAF has co-selected the remedy with the USEPA Region 9 and approves of the No Action decision for Sites 4, 11, 25, 28, and 34; as presented in this ROD.

Douglas H. Owens

DOUGLAS H. OWENS
Brigadier General, U.S. Air Force
Commander, 36th Wing

1 Oct 07

Date

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This signature page documents that the USEPA Region 9 has co-selected the remedy with the USAF and approves of the no action decision for Sites 4, 11, 25, 28, and 34; as presented in this ROD.

MICHAEL M. MONTGOMERY
Chief, Federal Facility and Site Cleanup Branch
U.S. Environmental Protection Agency, Region IX

11/2/07
Date

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This signature page documents that the Guam EPA concurs with the no action decision for Sites 4, 11, 25, 28, and 34; as presented in this ROD.

LORILEE T. CRISOSTOMO
Administrator
Guam Environmental Protection Agency

2-19-2008
Date

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2.0 Decision Summary

The Decision Summary identifies the selected remedies for Sites 4, 11, 25, 28, and 34; explains how the remedies fulfills statutory and regulatory requirements; and provides a substantive summary of the AR file that supports the remedy selection decision.

2.1 Site Names, Locations, and Descriptions

The following section presents descriptions of each of the five sites and their locations.

Site 4

Full Site Name: IRP Site 4/Landfill 6
CERCLIS ID Number: GU6571999519
Site Location: Yigo, Guam
Site Type: Landfill

Site 4 is located immediately north of the Andersen AFB Main Gate, approximately 300 feet northeast of Route 9 (Figure 1-2 and 2-1). The site was originally described as a 2-acre landfill that was utilized for the disposal of sanitary waste between 1953 and 1954 (Environmental Science and Engineering, Inc. [ESE], 1985). The site boundaries were expanded to include 14.5 acres following initial reconnaissance and interpretation of aerial photographs (EA Engineering, Science, and Technology, Inc. [EA], 2000a). The site is bordered to the north and east by undeveloped jungle, and is located within one mile of the nearest residential population.

Site 11

Full Site Name: IRP Site 11/Landfills 15A and 15B
CERCLIS ID Number: GU6571999519
Site Location: Yigo, Guam
Site Type: Landfill

Site 11 is located in the northern portion of the Main Base, on the eastern side of the intersection of 32nd and 36th Streets (Figure 1-2 and 2-2). Site 11 covers approximately 6.7 acres of undeveloped land, and is comprised of two suspected landfills (15A and 15B). Landfill 15A is located on the north side of 32nd Street, covers approximately 1.4 acres, and received sanitary trash and construction debris from the late 1950s to the early 1960s (ESE, 1985). Landfill 15B is located on the south side of 32nd Street, covers approximately 5.3 acres, and received sanitary trash, construction debris, and solvents in the 1950s and 1960s (ESE, 1985). The nearest residential population is located approximately 1.3 miles to the southwest, in the Base's unaccompanied housing area (Andersen AFB, 2006).

Site 25

Full Site Name: IRP Site 25/FTA-1
CERCLIS ID Number: GU6571999519
Site Location: Yigo, Guam
Site Type: Firefighter Training Area

Site 25 is located in the northern portion of the Main Base, between 36th Street and the secured Weapons Storage Area (WSA), and is partially covered by Building 51104 and associated asphalt pavement (Figure 1-2 and 2-3) (EA, 2007). The site covers approximately 5.7 acres that were utilized as a firefighter training area between 1945 and 1948. The nearest residential population is located approximately 1.25 miles to the southwest of the site, in the Base's unaccompanied housing area (Andersen AFB, 2006).

Site 28

Full Site Name: IRP Site 28/Chemical Storage Area 1
CERCLIS ID Number: GU6571999519
Site Location: Yigo, Guam
Site Type: Chemical Storage Area

Site 28 is located in the northeastern portion of the Main Base, near the end of the south runway (Figure 1-2 and 2-4). The site covers approximately 3.2 acres and is comprised of two physiographically distinct areas. The first area covers more than half the site and is a slope of fill material that is covered with low-lying grasses, shrubs, and mixed herbaceous plants. Abundant limestone boulders form the base of the slope. Limestone forest covers the area between the boulders. Unknown quantities of waste oils, lubricants, and solvents were possibly discarded over the cliff at the site during the early 1970s. The site is located approximately 1.5 miles east-northeast of the nearest residential population, which is located at the Base's unaccompanied housing area (Andersen AFB, 2006).

Site 34

Full Site Name: IRP Site 34/PCB Storage Area
CERCLIS ID Number: GU6571999519
Site Location: Yigo, Guam
Site Type: PCB Storage Area

Site 34 is located in the eastern portion of the Main Base (Figure 1-2 and 2-5). The site covers approximately 1.0 acre and consists of two former concrete storage pads that were located approximately 150 feet east of Building 20011. The concrete pads were used to store PCB-containing transformers from 1976 to 1992. The northern pad has since been removed, and construction of Building 20012 over the southern pad (Pad No. 20013) was completed in mid-2004. Building 20018, located on Site 34 to the southeast of Building 20012, was completed in 2006. The nearest population is located approximately 3,900 feet to the west-southwest of the site, in the Base's unaccompanied housing area (Andersen AFB, 2006).

2.2 Site History and Enforcement Activities

This section provides background information and summarizes the series of investigations that led to the ROD. It describes the CERCLA response actions undertaken at the Main Base OU, Sites 4, 11, 25, 28, and 34.

Due to its primary mission in national defense, the USAF has long been engaged in a wide variety of operations that involve the use, storage, and disposal of hazardous materials. On 14 October 1992, Andersen AFB was formally listed on the National Priorities List by the USEPA to investigate abandoned sites that may have been impacted by the use, storage, and disposal of hazardous materials.

As the lead agency, the USAF has conducted environmental investigation and remedial activities at the Main Base OU, Sites 4, 11, 25, 28, and 34 in accordance with CERCLA under the DERP, which was established by Section 211 of SARA.

As the support agencies, the USEPA Region 9 and the Guam EPA provide primary oversight of the environmental restoration actions, in accordance with the FFA. The enforcement activities for Andersen AFB were initiated when the USAF entered into a FFA with the USEPA Region 9 and the Guam EPA (USEPA et al., 1993). The FFA, finalized on 30 March 1993, established procedures for involving federal and territorial regulatory agencies, as well as the public, in the environmental restoration process at Andersen AFB. The FFA was based on applicable environmental laws, including CERCLA, Hazardous and Solid Waste Act of 1982, SARA, and the NCP.

Funding is provided by the Defense Environmental Restoration Account, a funding source approved by Congress to clean up contaminated sites on U.S. Department of Defense installations.

In accordance with USAF policy, to the extent practicable, National Environmental Policy Act (NEPA) values have been incorporated throughout the CERCLA process culminating in this ROD. Separate NEPA documentation will not be issued.

Sites 4, 11, 25, 28, and 34 have been evaluated in the following eleven environmental reports:

- *IRP Phase I: Records Search, Andersen AFB, Guam* (ESE, 1985)
- *Records Search for Andersen AFB, Guam* (ICF Technology, Inc. [ICF], 1996)
- *IRP Phase II - Confirmation/Quantification, Stage 1, Andersen AFB, Guam* (Phase II, Stage 1 Report) (Battelle Memorial Institute [Battelle], 1989)
- *Final Decision Document, No Further Response Action Planned (NFRAP) for IRP Site 04/Landfill 6, Andersen Air Force Base, Guam* (EA, 2000a)
- *Final Decision Document, No Further Response Action Planned (NFRAP) for IRP Site 11/Landfills 15A and 15B, Andersen Air Force Base, Guam* (EA, 1999a)
- *Final Decision Document, No Further Response Action Planned (NFRAP) for IRP Site 25/Firefighter Training Area 1 (FTA-1), Andersen Air Force Base, Guam* (EA, 2001)
- *Agency Draft Decision Document, No Further Response Action Planned (NFRAP) for IRP Site 28/Chemical Storage Area 1, Andersen Air Force Base, Guam* (EA, 2000b)
- *Battery Removal Report, IRP Site 28/Chemical Storage Area 1, Main Base Operable Unit, Andersen Air Force Base, Guam* (Groundwater Technology, Inc. [GTI], 2002)

- *Final Engineering Evaluation/Cost Analysis (EE/CA) for IRP Site 34/PCB Storage Area, Andersen Air Force Base, Guam* (EA, 1999b)
- *Remedial Verification Report, Interim Remedial Action for IRP Site 34/PCB Storage Area, Main Base Operable Unit, Andersen Air Force Base, Guam* (GTI, 2003)
- *Remedial Investigation for Sites 4, 11, 25, 28, and 34, Main Base Operable Unit, Andersen AFB, Guam* (EA, 2007)

Site 4

Site 4 was originally described as an approximately two-acre landfill that was used for disposal of sanitary waste between 1953 and 1954 (ESE, 1985). A site visit was performed in 1992 in conjunction with preparing the OU6 Work Plan (ICF, 1994a) and the Work Plan Addendum for OU4 (ICF, 1994b). As a result the site boundaries were expanded to eight acres during the 1992 site reconnaissance (Figure 2-1). Based on the interpretation of aerial photographs during the investigation phase, the site was extended to the east and north, increasing the site to approximately 14.5 acres.

An additional records search, conducted between October 1998 and July 1999, included a review of available Base historical documents, environmental reports, waste manifests, site maps and plans, and aerial photographs, as well as personnel interviews (EA, 2000a).

Real estate property vouchers for Building 14000 were reviewed at the Andersen AFB Real Property Office. According to the vouchers, Building 14000 was constructed in July 1954 for use as a Direction Finding (DF), Ultra High Frequency (UHF) Antenna, and was later referred to as an Instrument Landing System Marker Beacon. The building was used to provide power and navigational aid in conjunction with the operation of the antenna. From 1965 through 1975 the building and antenna were leased by permit to the Federal Aviation Administration. The last entry for Building 14000, recorded in a property voucher dated October 1976, changed the facility's utilization and category code. Information indicating when the building/antenna was decommissioned was not identified, nor was the dates when gas mask training operations were conducted at Building 14000.

Construction documents for Building 14000 and the associated access road were reviewed at the Andersen AFB Civil Engineer Squadron. The placement of Building 14000, the UHF/DF antenna, and the access road are presented in the 1954 "Site Plan Nav-Aid Bldg. UHF/DF AN/CRD-6." In contrast with current site conditions, a 10-foot-wide access road is shown extending from Route 9 northeast to Building 14000. The current access road extends northwest from Arc Light Boulevard to Building 14000, and aerial photographs taken in 1956 confirm this configuration. A debris disposal area was identified on the 1954 Site Plan on the north side of original access road, approximately 150 to 250 feet west of Building 14000. A notation on the plan states "debris pile to be cleared of all metal" but does not provide the dimensions or an exact location of the debris area. The 1954 Site Plan also presents specifications for Building 14000, an associated fuel tank, the antenna anchor mounts, and a topographical profile of the site. No information is provided on the 1954 Site Plan that indicates the location of a former landfill in the area south of Building 14000.

A second construction document, the "Plan and Profile of Access Road…to UHF/DF-CRD/6" (dated 15 May 1956), presents the details of the access road and the underground electrical conduit for Building 14000. As opposed to the 1954 Site Plan, the Plan and Profile matches current site conditions, with the access road connecting to Arc Light Boulevard. There is no indication of debris areas south of Building 14000, including the subsurface areas affected by the 2- to 3-foot-deep underground electrical duct. There is also no indication that an access road connecting Building 14000 to Route 9 exists. The construction project covered by plans associated with the Plan and Profile includes the construction of Building 14000, suggesting that the 1954 Site Plan may not have been "As Built."

A 24 May 1957 document titled "UHF Direction Finder AN/CRD-6 & AN/FRD-2 Plans and Details" presents details concerning the pier and anchor plan for the antenna. The typical plot plan of the UHF/DF antenna does not provide site-specific details. However, the plan does specify that the vegetation, except grass, should be cleared within a radius of 800 feet. It also specifies that power, communications, and control lines be buried for a minimum distance of 800 feet from the antenna.

A field investigation was conducted at Site 4 in 1999 and the results are summarized in the NFRAP and RI documents (EA, 2000a; EA, 2007). Surface and subsurface samples were collected and analyzed, and the results were used to perform a HHRA and ERA. The receptors of concern addressed by the HHRA were future resident adults and children and current and future occasional users/trespassers.

The HHRA and the ERA concluded that there are no unacceptable risks to human health or the environment associated with contaminants of potential concern (COPCs) identified at the site.

Site 11

Site 11 site is undeveloped and unfenced, and is comprised of two former landfills (15A and 15B) (Figures 2-2). Landfill 15A, the smaller of the landfill, is located on the north side of 32nd Street and covers approximately 1.4 acres. Landfill 15B is located on the south side of 32nd Street and covers approximately 5.3 acres.

Landfill 15A operated from the late 1950s to the early 1960s and received sanitary trash and construction debris. The site was operated as an "...area fill with shallow excavation followed by filling." Landfill 15B was used for disposal of sanitary trash and construction debris, and possibly solvents in the 1950s and 1960s. In 1981, intact drums containing trichloroethene (TCE), waste oils, and lead-based paint waste were discovered at Landfill 15B. Records indicate that in 1982 these drums and wastes were removed from the site and taken to the Defense Property Disposal Office (DPDO) for proper disposal.

In 1985, the initial phase of IRP activities at Andersen AFB commenced with a Phase I Records Search (ESE, 1985). The records search indicated that Landfill 15A (formerly Landfill 15) was located northeast of Landfill 15B (formerly Landfill 16), and was in operation from the late 1950s to the early 1960s. Landfill 15A was one acre in size and received sanitary trash and construction debris. The site was operated as an "...area fill with shallow excavation followed by filling" (ESE, 1985). Based on review of the historical documents and a site visit, the potential

for leachate formation and contamination were considered to be minimal. As a result, the site was removed from further investigation. Landfill 15A was listed in the Phase II, Stage 2 Report (Battelle, 1989), but was not investigated based on the decision process outlined in the Phase I Records Search (ESE, 1985).

The Resource Conservation and Recovery Act Facility Assessment (RFA) of Solid Waste Management Units (SWMUs) (Science Applications International Corporation [SAIC], 1986) identified Landfill 15A as one of the 63 SWMUs located on Andersen AFB. Landfill 15A was operated without release controls; however, no evidence of potentially hazardous releases in the area was observed and no records of releases were found. A records review and interviews did not indicate that hazardous wastes were disposed of at Landfill 15A. The report indicated that there was no potential for releases of hazardous materials to the groundwater, surface water, air, or subsurface from Landfill 15A (SAIC, 1986).

Landfill 15A was excluded from further investigation during the Phase II, Stage 2 investigation (Battelle, 1989) because there was no evidence to suggest that past practices at the site posed a risk to human health or the environment.

In preparation for the OU6 Work Plan (ICF, 1994a) in August 1992, a site reconnaissance was conducted. No new information was discovered during this site visit.

The 1996 Records Search (ICF, 1996) indicates that a set of drawings were found regarding Landfill 15A. One drawing titled "Area No. 1, Andersen AFB, Plot Plan, Existing Facilities" (dated 28 April 1952) showed a trash dump at the end of an access road, leading north from the 32nd Street extension. This trash dump was at approximately the same location as Landfill 15A. A second drawing, titled "Sewerage Facilities, 811th Area" (dated 21 October 1952), showed the layout of the area west of Landfill 15A. There was no evidence on the drawing that dumps were located nearby to the east, although a road was drawn in the direction of the site.

The Phase I Records Search, conducted in 1985, indicated that Landfill 15B was approximately 4 acres in size and was used for disposal of sanitary trash, construction debris, and possibly solvents in the 1950s and 1960s (ESE, 1985). The record search revealed that in 1981, intact drums containing TCE, waste oils, and lead-based paint waste were discovered at Landfill 15B. Records indicate that in 1982 these drums and waste were removed from the site and taken to the DPDO for proper disposal (ESE, 1985). Attempts were made to obtain the records regarding this removal action; however, according to the Defense Reutilization Marketing Office (DRMO) those records were archived five years after the removal.

Landfill 15B was reviewed as part of RFA (SAIC, 1986). Based on the site history, it was concluded that there was potential that contaminants could have been released to the groundwater, surface water, air, or the subsurface (SAIC, 1986).

Twenty sites were investigated based on the findings of the Phase II, Stage I report (Battelle, 1989). Sites that had no potential for contamination were deleted and were not assigned a Hazard Assessment Rating Methodology (HARM) score. Landfills 15A and 15B were combined as a single site and scored of 54 out of 100 points; the site was considered to have little

potential for adverse impact to human health (Battelle, 1989).

A field investigation was conducted at Site 11 in 1996–1997 and the results are summarized in the NFRAP and RI documents (EA, 1999a; EA, 2007). Surface and subsurface samples were collected and analyzed, and the results were used to perform a PRE. The receptors of concern addressed by the PRE were future residents and current and future occasional users.

The PRE concluded that there are no unacceptable risks to human health related to COPCs identified at the site. An ERA was not conducted at Site 11 because the site occupies a relatively small area within the developed portion of the Main Base that does not currently constitute suitable habitat, thereby resulting in incomplete exposure pathways for ecological receptors of concern (ROCs). In addition, due to the proximity to the active north runway future development in this area will be for industrial use.

Site 25

Site 25 covers an area of approximately 5.7 acres located between 36th Street and the secured WSA. The site is situated in the northern portion of the Main Base and is mostly covered by a portion of Building 51104 and associated asphalt pavement (Figure 2-3). Although the site was originally used for general training purposes between 1945 and 1958, it may have been used as a FTA between 1948 and 1955 when Building 51104 was constructed (ESE, 1985).

The Phase I Records Search initially identified Site 25 as a FTA and drum storage area located northeast of Andersen AFB's North Runway (ESE, 1985). According to the Phase I Records Search report, the site consisted of an unlined FTA where fuels were discharged on the exposed surface and were then burned. Approximately 200 gallons of waste and contaminated fuels were reportedly used per exercise with one to two exercises occurring per month. A 1986 RFA Report concluded "there exists a high potential for past releases to soil and groundwater from this area due to application of the waste fuels to porous ground." However, the October 1985 Phase II, Stage 1 investigation concluded that there was no evidence of contamination at the reported location (Battelle, 1989). Because there was no evidence of the former FTA, an agreement was reached between the Guam EPA and the USAF stating that the site did not require further investigation.

In August 1992, a drawing was obtained from the Base Civil Engineer showing an area labeled "AAFB Fire Fighting School" located on the northern side of North Field, between 36th Street and the secured WSA. The school was located in the proximity of what is now Building 51104. The drawing depicted a B-17 fuselage, a drum storage area, and a rectangular burn pit located at the eastern side of the 5-acre clearing, east of the "Fire Fighting School" and west of 38th Street. During the 1998 field investigation, the drawing could not be found and this information could not be confirmed (EA, 2001). The site may or may not have been used as a FTA between 1948 and 1955.

A site investigation was conducted between 26 August and 3 November 1998 and the results are summarized in the NFRAP and RI documents (EA, 2001; EA, 2007). Surface and subsurface soil samples were collected and analyzed, and the results were used to perform a HHRA. The receptors of concern addressed by the HHRA were future resident adults and children and

current and future occasional users/trespassers.

The HHRA concluded that the COPCs identified on site posed no unacceptable risks to human health. During the investigation, no evidence of former firefighter training activities was observed.

A quantitative ERA was not performed at the Site 25 because the site occupies a relatively small area within the developed portion of the Main Base that does not currently constitute suitable habitat, thereby resulting in incomplete exposure pathways for ecological ROCs. In addition, due to the proximity to the active north runway future development in this area will be for industrial use.

Site 28

Site 28 covers an area of approximately 3.2 acres. The site is located in the northeastern portion of the Main Base, near the end of the south runway (Figure 2-4) and is comprised of two physiographically distinct areas. The first area, which comprises more than half of the site, is a slope that is covered with low-lying grasses, shrubs, and mixed herbaceous plants. Abundant limestone boulders line the base of the slope. Historical aerial photographs and the site investigation attribute the extensive fill (limestone boulders, concrete blocks, asphalt chunks, metal debris, coral gravels, and soils) to materials that were used for the extension of the south and north runways (ESE, 1985). Evidence of buried debris is visible along the slope and amongst the boulders. The remaining portion of the site below the boulders consists of a hummocky limestone forest with sharply pitted surface features and solution cavities.

The Phase I Records Search (ESE, 1985) reported that, during the early 1970s, unknown quantities of waste oils, lubricants, and solvents may have been discarded over a cliff at the east end of the south runway. The area also was identified as a potential habitat for several endangered species. The site was assessed using the HARM, in which factors such as site characteristics, waste characteristics, potential for contaminant migration, and waste management practices were considered. The site received a HARM score of 55 out of 100 points, ranking it as medium to low (ESE, 1985). The Phase I Records Search recommended that a survey be conducted using an organic vapor analyzer to determine whether organic vapors were present in the soils and, if vapors were detected, then lysimeters should be installed and monitored. No drawings were provided in the Phase I Records Search that specified the location of Site 28.

Site 28 was not included in the Phase II, Stage 1 investigation (Battelle, 1989) because field crews failed to locate the site prior to beginning the Phase II field work. Field observations made in August 1992 identified Site 28 at the base of a slope that was overgrown with shrubs and herbs (ICF, 1996).

Aerial photographs of this site are scarce and available photographs do not provide enough detail to determine past disposal activities at this site (ICF, 1996).

A field investigation was conducted at Site 28 in 1999 and the results are summarized in the NFRAP and RI documents (EA, 2000b; EA, 2007). Surface and subsurface soil samples were

collected and analyzed, and the results were used to conduct a HHRA and ERA. The receptors of concern addressed by the HHRA were future resident adults and children and current and future occasional users/trespassers.

The HHRA and the ERA concluded that there are no unacceptable risks to human health or the environment associated with COPCs identified at the site. However, the presence of numerous aircraft batteries at the site posed the potential for the future release of lead to soils (EA, 2000b), and the NFRAP document recommended a removal action for the batteries. A removal action that consisted of the removal and proper disposal of 68 lead-acid aircraft batteries from the side and bottom of the hillside at removed the batteries was conducted from 17 to 24 October 2002 (GTI, 2002).

Site 34

Site 34 covers an area of approximately 1.0 acre and is located in the eastern portion of the Main Base (Figure 2-5). The site consists of two former concrete storage pads (northern pad and southern pad [Pad No. 20013]) that were located approximately 150 feet east of Building No. 20011. The southern pad measured approximately 110 feet by 65 feet and was enclosed by a secured chain-link fence. The southern pad included two shallow (6-inch) bermed basins (approximately 12 feet by 6 feet) positioned side by side in the northeastern quadrant. Base real property records identified the southern pad as Pad No. 20013. The northern pad measured approximately 100 feet by 60 feet and was unfenced. Based on available information, the northern pad did not have an assigned facility identification number. The storage pads were bordered to the west by the parking lot/access road for Building 20011. A fenced storage yard, referred to as Civil Engineer (CE) Open Storage Yard, abutted the site to the south. A maintained field of grass bordered the eastern side of the storage pads and the northern pad was located approximately 50 feet south of Arc Light Boulevard. The site study area initially included Pad No. 20013 and the CE Open Storage Yard. Subsequent to a review of historical documentation, Base personnel interviews, and site reconnaissance, the boundaries of the site study area were modified to include the northern storage pad only.

According to Base records, the southern pad (Pad No. 20013) was constructed in May 1958 as a military dog kennel. Base real property records indicate that the pad was re-designated as the CE Open Storage Yard on 16 May 1972. According to the Phase I Records Search (ESE, 1985), the earliest use of Pad No. 20013 for storage of PCB-containing transformers was in 1976, when the U.S. Navy Public Works Center (USN-PWC) initiated a program to replace equipment containing PCB dielectric fluid with equipment containing mineral oil. However, Base Electrical Shop personnel and former USN-PWC personnel have reported that the northern pad, not Pad No. 20013, was actually the former transformer storage area used by the USN-PWC until 1992. The Base Electrical Shop personnel reported that their department had utilized Pad No. 20013 since 1994 for the storage of various supplies, including non-PCB containing transformers, electric cable, and conduit (EA, 1999b). It is not known when use of the northern pad was discontinued after 1992.

Site 34 was not identified as a site during the Phase I Records Search (ESE, 1985). However, the report did mention the use of Pad No. 20013 (adjacent to Building 20011) in a section that discussed PCB handling, storage, and disposal. The Phase I Records Search report indicated that

the USN-PWC utilized this pad for the storage of out-of-service electrical components. According to the Phase I Records Search, all transformers had been removed from the pad at the time of the report (1985) and no dielectric fluid residues were observed on or near the pad. In addition no historical PCB spills were identified, although several minor leaks were reported. According to the Phase I Records Search, USN-PWC personnel cleaned up the leaked fluids and took them to the DRMO for disposal. The report also mentioned a USN-PWC program, initiated in 1976, to replace PCB dielectric fluid-filled equipment. The Phase I Records Search however did not confirm the use of Pad No. 20013 for this purpose.

Site 34 was added to the Phase II, Stage 1 investigation (Battelle, 1989) which reported that the site was actively used for the temporary storage of transformers and other electrical equipment. Several PCB-containing transformers were observed within the fenced compound (Pad No. 20013) at the time of the Phase II, Stage 1 investigation.

The Work Plan Addendum for OU5 (ICF, 1994c) identified the site as the fenced-in concrete pad known as Pad No. 20013. In addition, the site boundaries were expanded to include the fenced storage area to the south (the CE Open Storage Yard). The Work Plan Addendum for OU5 also reported that a technical memorandum prepared for Site 34 in September 1991 concluded:

> *"Since there are no completed exposure pathways (surface water, soil, groundwater, or atmospheric) to any receptors, the potential threat to human health or the environment resulting from activities at this site is negligible. No further action is the recommended alternative for the PCB site."*

The Work Plan Addendum for OU5 (ICF, 1994c) also contained a PRE that included the results of the limited sampling that was performed as part of the 1989 Phase II, Stage 1 investigation (Battelle, 1989). The PRE for Site 34 determined that the potential risks from potential receptors (construction workers, maintenance workers, and trespassers) exposed to three contaminants of concern (COCs) (pyrene, fluoranthene, and PCB Aroclor-1260) were within acceptable levels as per USEPA guidance for Superfund sites.

The 1996 Records Search report (ICF, 1996) identified Site 34 as an electrical equipment storage pad. The related report indicated that Site 34 was only operated as a staging area by USN-PWC, where transformers were drained of dielectric fluids prior to shipment through the DRMO. The site was in use from 1976 through 1992, and no electrical equipment was observed on the pad during the August 1992 site visit. Andersen AFB Environmental Protection Committee meeting minutes (ICF, 1996) indicated that the last two PCB-containing drums were removed from the site on 23 July 1992. The PCB Annual Reports were also reviewed as part of the 1996 Records Search and provided an inventory of transformers present at Andersen AFB, the date each was sampled, the sampling results, and the date they were removed from service. However, the PCB Annual Reports did not identify the organization responsible for removing the transformers from service, the location where each transformer was placed prior to the removal of dielectric fluid, or the date of transfer to DRMO.

Although the 1996 Records Search report did not identify spill incidents at the site, a review of Fire Department records, dating back to 1991 (when record keeping was initiated), identified Environmental Flight records that mention a PCB discharge at an "Outdoor Storage Yard" (ICF,

1996). This document also reported an October 1988 site visit by Guam EPA personnel in response to a citizen inquiry. The Guam EPA noted that electrical equipment, including transformers, were stored in the fenced compound and that the two bermed basins contained rainwater with oil an oil film floating on top. Wipe and water samples were collected on 15 October 1988. In addition, on 27 December 1988 the water was removed from the bermed basins and miscellaneous debris was also removed. The fence around the pad had been removed between October 1988 and a site visit in June 1993, and the area was no longer being used to store electrical equipment. No mention was made of any additional storage pads in the vicinity.

During the EE/CA investigation, conducted between May and October 1997, another records search was conducted for Site 34, including a review of available Base historical documents, environmental reports, waste manifests, site maps and plans, and aerial photographs, as well as personnel interviews (EA, 1999b). Real Estate Voucher Nos. 720108 through 720112, located in the Andersen AFB Real Property Office files, indicated Site 34 was known as Facility No. 20013, Canine Kennel. The real property voucher, dated 16 March 1972, made a minor correction to real property inventory records by changing the designation of 880 square yards (yd^2) of the Canine Kennel to the Open Storage, Base category. No other real property vouchers were located for this site.

A "*Record of PCB Spill Cleanup*" memorandum (USN-PWC, 1988) was also identified during the 1997 record search. The memorandum detailed the aforementioned actions taken by USN-PWC, between 7 October 1988 and 27 December 1988, in response to a citizen inquiry about improper storage of PCB-containing equipment at Pad No. 20013. As documented in the 1996 Records Search report, a spill resulted from the overflow of rainwater in the bermed basins located within Pad No. 20013 (ICF, 1996). The memorandum confirmed that wipe and water samples were collected, and a removal action was performed. As part of the removal action, the rainwater in the berm and a 6-foot-diameter circular section of asphalt were removed along the western edge of the Pad No. 20013. All PCB wastes were drummed and sent to DRMO for disposal.

As part of the 1997 records search, personnel interviews were conducted with Base Electrical Shop and CE Environmental Flight personnel familiar with site activities. Mr. Eddie Eclavea and Mr. John Suzuki of the Base Electrical Shop stated that PCB-containing transformers were never stored within the fenced area at the southern pad. They stated that prior to 1962, the southern pad was used as the Base Dog Kennel, and in 1964 it became a storage area for the Base Electrical Shop. They did confirm that the northern pad was used for storing transformers prior to disposal and described how leaking transformers were placed in "pans" to prevent spills. In addition, interviews with Mr. Fred Leon Guerrero and Mr. Dave Fejeran of the CE Environmental Flight confirmed the use of the northern pad for storage of PCB-containing transformers. Mr. Fejeran, who previously worked for USN-PWC from 1986 to 1993, recalled that a soil removal action was conducted (circa 1990) on the northwestern edge of the northern pad. He also recalled the removal of soil and asphalt from the middle of the southern pad's western side in response to the 1988 spill. According to Mr. Fejeran, the 1988 spill, referred to in the 1996 Record Search report and the Record of PCB Spill Cleanup memorandum, was caused by leaking transformers located in the secondary spill containment (bermed basins).

Aerial photographs were reviewed during the completion of the 1996 Records Search for

Andersen AFB (ICF, 1996). An aerial photograph not examined for earlier reports was also identified during the EE/CA investigation (EA, 1999b).

Aerial photographs taken from 1946 through 1984 showed the evolution of the Site 34 from development of temporary structures in the vicinity (1946 through 1948), to the clearing of the area to bedrock (1956), to the presence of a structure on the site (1959), and to the use for PCB handling and storage (1984). In a 1993 aerial photograph equipment were observed on the southern pad (EA, 1999b) and equipment and/or building supplies were observed on the northern pad. A cleared area is visible along the northern side of this pad, in the vicinity of the 1990 removal action.

A field investigation was conducted at Site 34 in 1997 and the results are summarized in the EE/CA and RI documents (EA 1999b; EA, 2007). Surface and subsurface soil samples were collected and analyzed, and results were used to conduct a HHRA. The receptors of concern addressed by the HHRA were future resident adults and children, future construction workers, current and future occasional adult users/trespassers, and current and future commercial/ industrial workers. The HHRA concluded that PCBs (Aroclors-1254 and -1260) posed unacceptable risks to human health. RGs were developed for PCBs that were protective of potential future residential receptors.

After completion of the EE/CA (EA, 1999b), a removal action was conducted at Site 34 to mitigate site risks. The removal action was performed during two distinct phases, October 1999 through January 2000 (initial remediation) and June 2002 through October 2002 (additional remediation) (GTI, 2003). The removal actions consisted of removing and disposing of PCB-contaminated soil and concrete from five areas (Hot Spots A through E) (Figure 2-6). The project objective was to remove and dispose of PCB-contaminated soil at concentrations exceeding the project-specific RGs. Mobilization for the initial and additional remediation phases commenced on 25 October 1999 and 26 June 2002, respectively.

During the initial remediation phase approximately 102 loose cubic yards (lcy) of PCB-contaminated soil were removed from Hot Spots A through E. Confirmation samples were collected and analyzed for PCBs, and based on the analytical results soil with PCB concentrations exceeding the RGs remained at Hot Spots C, D, and E. An additional 196 lcy of PCB-contaminated soil, 27 lcy of concrete, and 4 lcy of soil and concrete were removed from Hot Spots C, D, and E and confirmation samples were collected from February 2002 through September 2002. All of these confirmation soil sample results were below the project-specific RGs.

The site was restored by backfilling excavations with clean fill and placing topsoil and vegetation in areas where vegetation had been disturbed. The backfill was placed in 6- to 12-inch loose lifts and compacted to a minimum of 85 percent or 95 percent of the maximum dry density. The topsoil was placed as the final 4 inches of material in the vegetated areas. The areas where topsoil was placed were watered twice a day for 14 days, and natural grass was allowed to re-vegetate these areas.

The soil and concrete characterized as PCB remediation waste, with PCB concentrations below 50 milligrams per kilogram (mg/kg), was transported to the Andersen AFB Sanitary Landfill for

disposal. The soil and concrete characterized as Toxic Substances Control Act (TSCA)-regulated PCB waste, with PCB concentrations exceeding 50 mg/kg, was transported to an off-island, permitted facility for disposal. The Remediation Verification Report (RVR) (GTI, 2003) stated that the objective of removing and disposing of PCB-contaminated soil and concrete (exceeding RGs) was met.

Two buildings were constructed at Site 34 after completion of the RVR. Building 20012 was built in 2004 and is used as the 36th Air Mobility Response Squadron Warehouse. Building 20018, located southeast of Building 20012, was built in 2006 and is used as the Federal Bureau of Investigation Forward Command Support Warehouse. Additionally, the fences surrounding the CE Open Storage Yard and the southern pad (Pad No. 20013) were removed.

2.3 Community Participation

NCP Section 300.430(f)(3) establishes a number of public participation activities that the lead agency must conduct following preparation of the Proposed Plan and review by the support agency. Components of these items and documentation of how each component was satisfied for Sites 4, 11, 25, 28, and 34, at Andersen AFB, Guam, are described in Tables 2-1 and 2-2.

USAF responses to comments received during the public comment period are included in the Responsiveness Summary, which is provided as Section 3 of the ROD.

2.4 Scope and Role of Operable Unit

As with many large sites, the environmental problems at Andersen AFB, Guam, are complex. As a result, the USAF, with concurrence from the USEPA Region 9 and Guam EPA, has organized the environmental restoration program at Andersen AFB into six OUs as described below.

Main Base OU (Sites 2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 14, 15, 25, 26, 27, 28, 29, 34, and 35) – RODs addressing the Main Base OU are currently underway. It is anticipated that the RODs for Groups 1, 2, and 3 will be completed by December 2007, and the RODs for the remaining sites by July 2008. The sites are proposed to be addressed in seven separate ROD documents as follows:

- Sites 6, 9, and 12 (Group 1)
- Sites 5 and 8 (Group 2)
- Sites 4, 11, 25, 28, and 34 (Group 3)
- Sites 3, 10, 13, 14, 15, and 27 (Group 4)
- Site 2 (Group 5)
- Site 26
- Sites 29 and 35

Northwest Field OU (Sites 7, 16, 17, 21, 30, 31, and 36) – An Agency Draft ROD addressing Sites 7, 16, 17, 31, and 36 was completed in April 2007. It is anticipated that all Northwest Field OU RODs will be completed by December 2008.

Marianas/Bonins Command (MARBO) Annex OU (Sites 20, 22, 23, 24, 37, and 38) – A Final ROD addressing the MARBO Annex OU was completed in May 1998 and a Five-year ROD Review was completed in July 2004.

Harmon Annex OU (Sites 18, 19, and 39) – A Final ROD addressing the Harmon Annex OU was completed in July 2002.

Urunao OU (Site 40) – A Final ROD addressing the Urunao OU was completed in December 2003.

Site Wide OU (Sites 41 through 78) – The Site Wide OU consists of IRP sites that have been added to the program in recent years and the sites are distributed geographically across the Main Base, Northwest Field, and MARBO Annex.

2.5 Site Characteristics

This section describes the physical characteristics of the five sites addressed in this ROD. Brief descriptions are provided for each site. Guam is the largest, most populated, and southernmost island in the Mariana Islands, located in the western Pacific Ocean (Figure 1-1). Relative to Guam, Hawaii is located 3,700 miles to the east-northeast and Japan is located 1,560 miles to the north. Guam is approximately 30 miles long, varies in width from 4 to 12 miles, and has a total land area covering approximately 209 square miles.

2.5.1 Physiography and Climate

Physiographically, the island of Guam may be divided into northern and southern regions, which are separated by the Adelup Fault. The northern region is a limestone plateau consisting of rolling hills and cliff lines ranging from 200 to 600 feet above mean sea level (msl).

Andersen AFB consists of multiple parcels of land located in Yigo, on the northern half of Guam (Figure 1-2), and is situated on an undulating limestone plateau with surficial karst features. The Base property includes the Main Base (formerly North Field) and the Northwest Field. It is approximately 8 miles wide by 2 to 4 miles long, and covers approximately 24.5 square miles.

Guam is located at 13º 27’ north latitude (approximately 900 miles north of the equator), creating a year-round warm and humid climate. The mean annual temperature is 81 degrees Fahrenheit (ºF). Daily temperatures range from the lower 70s to the upper 80s ºF. Relative humidity ranges from 65 to 80 percent in the afternoon and 85 to 100 percent in the evening. Guam has two distinct seasons, a wet and a dry season. The dry season is typically from December to June, and the wet season occurs from July through November. Approximately 65 percent of the annual precipitation falls during these five rainy months, and the annual rainfall on northern Guam averages between 80 and 100 inches.

The dominant winds are the trade winds, blowing from the east or northeast with velocities between 4 and 12 miles per hour (mph) throughout the year. Storms may occur at any time during the year, although tropical storms and typhoons are more frequent during the rainy season. Large rainfall events associated with typhoons are common, with as much as 25 inches

of rain in a 24-hour period (Ward et al., 1965).

These climatic conditions hold true for all sites covered by this ROD. Site-specific physiography is discussed in more detail in the sections below.

Site 4

Site 4 covers approximately 14.5 acres and is located immediately north of the Andersen AFB Main Gate (Figure 2-1). The access road bisects Site 4 and leads to a small concrete structure (Building 14000) located approximately 100 feet outside the northeastern border of the site. Arc Light Boulevard is located southeast of the site. Route 9 lies approximately 300 feet southwest of the site and runs parallel to the site's western border. The site is bordered to the north and east by undeveloped, jungle areas. Vegetation at the site consists primarily of grassland habitat, mixed shrub habitat, and mixed herbaceous habitat. The surface of the site slopes toward the north, with elevations ranging between 598 and 614 feet above msl (Figure 2-7). The nearest surface water body is the Pacific Ocean, which is located approximately 14,000 feet east of the site.

Site 11

Site 11 covers approximately 6.7 acres and is located in the northern portion of the Main Base, on the eastern side of the intersection of 32nd and 36th Streets (Figure 2-2). The site is undeveloped and unfenced, and consists of two landfills (15A and 15B). The Base Entomology Shop (Building 2799), located adjacent and to the west of the site, is used to store and handle herbicides, insecticides, and the equipment used for applying these chemicals. Landfill 15A, the smaller of the two landfills, is located on the north side of 32nd Street and covers an area of approximately 1.4 acres. Ground surface elevations range from 550 to 571 feet above msl (Figure 2-8). Landfill 15B is located on the south side of 32nd Street and covers an area of approximately 5.3 acres. Vegetation at the site consists primarily of mixed herbaceous habitat, with several smaller areas of mixed shrub habitat. Ground surface elevations range from 532 to 552 feet above msl (Figure 2-8). The nearest surface water body is the Pacific Ocean, which is located approximately 2,200 feet north of the site.

Site 25

Site 25 covers approximately 5.7 acres and is located in the northern portion of the Main Base. The site is currently covered by a portion of Building 51104 and associated asphalt paved areas (Figure 2-3). Ground surface elevations range from approximately 554 to 555 feet above msl

(Figure 2-9). The nearest surface water body is the Pacific Ocean, which is located approximately 3,000 feet north of the site.

Site 28

Site 28 covers approximately 3.2 acres and is located in the northeastern portion of the Main Base, near the end of the south runway (Figure 2-4). Site 28 is comprised of two physiographically distinct areas. The first area, which covers the majority of the site, is a slope comprised covered with low-lying grasses, shrubs, and mixed herbaceous plants. Abundant limestone boulders line the base of the slope. The portion of the site below the boulders consists of a rugged plateau covered with limestone forest. Surface elevations at the site range from 520 to 595 feet above msl (Figure 2-10). The nearest surface water body is the Pacific Ocean, which is located approximately 1,000 feet east of the site.

Site 34

Site 34 covers less than 1.0 acre and is located in the eastern portion of the Main Base. The site consists of two former concrete storage pads that were located approximately 150 feet east of Building 20011, (Figure 2-5). The northern of the two former storage pads was located approximately 50 feet south of Arc Light Boulevard and has been removed and the area covered with grass. Construction of Building 20012 was completed mid-2004 over the approximate location of the former southern pad (Steiner, 2006). Construction of Building 20018, located southeast of Building 20012, was completed in 2006. The surface elevations at the site range from approximately 604 to 607 feet above msl (Figure 2-11). The nearest surface water body is the Pacific Ocean, which is located approximately 3,200 feet east of the site.

2.5.2 Geology and Hydrogeology

Sites 4, 11, 25, 28, and 34 are underlain by the Mariana Limestone, which is underlain by the Barrigada Limestone. The Barrigada Limestone is underlain by the volcanic deposits of the Alutom Formation.

Surface soils and bedrock are very porous and permeable and as a result, no rivers or streams are present in the northern portion of the island. Precipitation, except that portion lost to evapotranspiration, contributes to the groundwater lens.

Site 4

Earth moving and re-grading has disturbed most soils at Site 4 and exposed the bedrock in the vicinity of the access road. Where present, the soils at Site 4 consist of the Guam Cobbly Clay Loam. During intrusive activities at the site, the thickness of the soil ranged from 0 to 9 feet thick and the texture varied from sandy silt to gravelly silt with some sands. The color of the soil is dark reddish-brown.

Groundwater beneath Site 4 is approximately 350 feet below ground surface (bgs), under parabasal conditions, and flow is to the east-southeast.

Site 11

The soils present at Site 11 consist of the Guam-Urban Land Complex. This unit is about 55 percent Guam Cobbly Clay Loam and 45 percent Urban Land (Young, 1988).

Groundwater beneath Site 11 is approximately 530 to 570 feet bgs, under basal conditions, and flow is to the northeast.

Site 25

The soils present at Site 25 consist of the Guam-Urban Land Complex. This unit consists of approximately 55 percent Guam Cobbly Clay Loam and 45 percent Urban Land (Young, 1988).

Groundwater beneath Site 25 is approximately 540 feet bgs, under basal conditions, and flow is to the northeast.

Site 28

The soils present at Site 28 consist of two types: artificial fill and Ritidian Rock Outcrop Complex. The artificial fill makes up 70 percent of the total site area and is located in the areas of debris from the top of the slope down to the toe of the slope, and slightly beyond at depths up to several feet bgs. This soil unit is composed of Guam Cobbly Clay Loam and Urban Land underlain by coral boulders. The depth to limestone beneath the fill material is unknown.

The Ritidian Rock Outcrop makes up the remaining 30 percent of the soil at Site 28 (Young, 1988), which extends east from the toe of the slope. The soil is a derivative of coralline limestone and is mildly to moderately alkaline. Typically, it is composed of 45 percent cobbly clay loam which is dark reddish brown and moderately permeable. The remainder of the soil is composed of 35 percent rock outcrop, 10 percent Guam Cobbly Clay Loam, and 10 percent Ritidian Rock Outcrop composed of steep slopes.

Groundwater beneath Site 28 is approximately 550 feet bgs, under basal conditions, and flow is to the east.

Site 34

The soils present at Site 34 consist of the Guam-Urban Land Complex. This soil unit is composed of 55 percent Guam Cobbly Clay Loam and 45 percent Urban Land. Most of the soil at Site 34 is covered by either the concrete storage pad or asphalt associated with parking lots/access roads. The only exposed soil is located along the northern and western edges of the storage pads. During surface soil sampling, soil was approximately 4 inches deep and underlain by a hard fill layer of cobbles.

Groundwater beneath Site 34 is approximately 600 feet bgs, under basal conditions, and flow is to the east-northeast.

2.5.3 Surface Water Hydrology

No wetlands or surface water are located in the vicinity of Sites 4, 11, 25, 28, or 34. The geology in the region is dominated by highly porous limestone bedrock located below very shallow soils with moderately rapid permeability. As a result, storm water runoff is slow and precipitation readily infiltrates into the vadose zone, preventing the formation of surface streams, rivers, and lakes.

2.5.4 Ecology

Site 4

Three major habitat types were identified at Site 4: Grassland (generally the northwestern and southeastern areas), mixed herbaceous vegetation (generally the central portion of the site), and Active Base/Maintained Areas (adjacent to the unpaved access road and Building 14000). Although there are several threatened and endangered species within Andersen AFB, none of the critical habitats for these species are located within Site 4.

Site 11

Site 11 is an inactive former landfill that consists primarily of mixed herbaceous habitat, with several smaller areas of mixed shrub habitat. These areas are bordered by Active Base land uses. Site 11 is small in size, and lacks significant habitat that would be expected to support ecological ROCs. In addition due to its proximity to the active runway it is within an area where natural habitat is not encouraged.

Site 25

Site 25 was a reportedly a former FTA. Although there are several threatened and endangered species on Guam, none of the critical habitats for these species are located within Site 25 (ICF, 1994d). Asphalt pavement and Building 51104 cover the majority of the site. No trees or shrubs are present at the site, and the small areas of grass cover are maintained. The site is small, restricted, mostly paved, and lacks significant habitat that would be expected to support ecological ROCs. In addition due to its proximity to the active runway it is within an area where natural habitat is not encouraged.

Site 28

Site 28 is an inactive disposal area located east of the south runway. It is bordered by the flight line perimeter to the west and northwest and a mature limestone forest to the northeast, south, and east. Site 28 is located near the nesting and foraging range of the Mariana crow, and is also located near the distribution range of the Micronesian starling, and within the distribution and foraging range of the Mariana fruit bat. No Mariana fruit bat, Mariana crow, Micronesian starling, or endangered plant species were observed (either directly or signs) during the ecological habitat assessment.

Site 34

Site 34 consisted of two concrete pads and contains little on-site vegetation or habitat that would be expected to attract or support animal life. The site is small, mostly paved, and lacks significant habitat that would be expected to support ecological ROCs. In addition due to its proximity to the active runway it is within an area where natural habitat is not encouraged.

2.5.5 Previous Site Characterization Activities

Site 4

A field investigation was conducted at Site 4 in 1999 and the results are summarized in the NFRAP and RI documents (EA, 2000a; EA, 2007). The field investigation included site reconnaissance/detailed site inventory (DSI), a geophysical survey, a soil gas survey, test ditch/pit excavations, and surface and subsurface soil sampling. A total of 20 surface and 3 subsurface soil samples were collected at the site:

- Surface soil samples were analyzed for semivolatile organic compounds (SVOCs), polycyclic aromatic hydrocarbons (PAHs), target analyte list (TAL) metals, and cyanide.
- Subsurface soil samples were analyzed for volatile organic compounds (VOCs), SVOCs, PAHs, TAL metals, and cyanide.

Inorganics (aluminum, cadmium, manganese, and vanadium) were detected at concentrations exceeding risk-based screening levels (residential preliminary remedial goals [PRGs]). As a result, a HHRA and ERA were performed (EA, 2000a; EA, 2007). Based on results of the updated HHRA, no unacceptable risks were identified for occasional user/trespassers or future resident adult/child receptors associated with exposure to any of the COPCs identified in surface or subsurface soil at the site. Therefore, no COCs were identified, and no RGs were developed. Based on the ERA, there were no unacceptable risks to ecological receptors identified, and no ecological RGs were developed.
A CERCLA "No Action" decision is deemed appropriate for Site 4, and no feasibility study (FS) is required.

Site 11

A field investigation was conducted at Site 11 in 1996–1997 and the results are summarized in the NFRAP and RI documents (EA, 1999a; EA, 2007). The field investigation included site a DSI, a geophysical survey, soil gas survey, test ditch/pit excavations, and surface subsurface soil sampling. A total of 14 surface and 6 subsurface soil samples were collected at the site:

- Surface soil samples were analyzed for SVOCs, PAHs, TAL metals, cyanide, and dioxins/furans.
- Subsurface soil samples were analyzed for VOCs, SVOCs, TAL metals, cyanide, and dioxins/furans.

Inorganics (chromium) and organics (benz(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene) were detected at concentrations exceeding risk-based screening levels. As a result, a PRE was performed. Based on results of the PRE and the updated PRE, no unacceptable risks were identified for industrial worker or future resident adult/child receptors associated with exposure to any of the COPCs identified in surface or subsurface soil at the site. Therefore, no COCs were identified, and no RGs were developed.
An ERA was not conducted at Site 11 because the site occupies a relatively small area within the developed portion of the Main Base that does not constitute suitable habitat for ecological receptors. In addition, future development in this area will likely be for industrial use due to it's proximity to the active runway.

A CERCLA "No Action" decision is deemed appropriate for Site 11, and no FS is required.

Site 25

A field investigation was conducted at Site 25 in 1998 and the results are summarized in the NFRAP and RI documents (EA, 2001; EA, 2007). The field investigation included a DSI, a soil gas survey, and surface and subsurface soil sampling. A total of 7 surface and 3 subsurface soil samples were collected at the site:

- Surface soil samples were analyzed for SVOCs, PAHs, pesticides, PCBs, TAL metals, cyanide, and dioxins/furans.

- Subsurface soil samples were analyzed for VOCs, SVOCs, PAHs, pesticides, PCBs, TAL metals, cyanide, and dioxins/furans.

Organics (tetrachlorodibenzo-p-dioxin–toxic equivalent concentration and benzo(a)pyrene) were detected at concentrations exceeding risk-based screening levels in surface soil. No contaminants exceeded risk based levels in the subsurface soil samples. Based on results of the HHRA and the updated HHRA (EA, 2007), no unacceptable risks were identified for the occasional user/trespasser or future resident adult/child receptors associated with exposure to any of the COPCs identified in surface soil at the site. Therefore, no COCs were identified, and no RGs were developed.
A quantitative ERA was not performed at Site 25 due to the lack of suitable habitat for ecological receptors. The site is located in the developed portion of the Main Base; asphalt pavement and Building 51104 cover the majority of Site 25 and it does not constitute suitable habitat for ecological receptors. In addition, future development in this area will likely be for industrial use due to it's proximity to the active runway.
A CERCLA "No Action" decision is deemed appropriate for Site 25, and no FS is required.

Site 28

A field investigation was conducted at Site 28 in 1999 and the results are summarized in the NFRAP and RI documents (EA, 2000b; EA, 2007) documents. The field investigation included

a DSI, a geophysical survey, test pitting, and surface and subsurface soil sampling. A total of 22 surface and 4 subsurface soil samples were collected at the site:

- Surface soil samples were analyzed for SVOCs, PAHs, TAL metals, and cyanide.
- Subsurface soil samples were analyzed for VOCs, SVOCs, PAHs, TAL metals, and cyanide.

Inorganics (cadmium and lead) and organics (benzo(a)pyrene) were detected at concentrations exceeding risk-based screening levels in surface soil. No contaminants exceeded risk-based screening levels in subsurface soil samples. As a result, an HHRA and ERA were performed (EA, 2000b; EA, 2007). The HHRA and updated HHRA determined that there were no unacceptable risks for occasional user/trespasser or future resident adult/child receptors associated with exposure to any of the COPCs identified at the site (EA, 2007). Therefore, no COCs were identified, and no RGs were developed. The ERA and updated ERA determined that there were no unacceptable risks to ecological receptors (EA, 2007). Therefore, no COCs were identified, and no ecological RGs were developed.

A number of lead-acid aircraft batteries were discovered during the field investigation at the site. Although the risk assessment identified no unacceptable risks to human health or the environment at the site, the batteries were removed to prevent the potential for future release of lead to the soil. The removal action was performed at Site 28 during 17–24 October 2002. A total of 68 lead-acid aircraft batteries were removed from the side and base of the slope and were properly disposed of, reducing the potential for future onsite contamination.

A CERCLA "No Action" decision is deemed appropriate for Site 28, and no FS is required.

Site 34

A field investigation was conducted at Site 34 in 1997 and the results are summarized in the EE/CA and RI documents (EA 1999b; EA, 2007). The field investigation included a DSI, surface soil sampling, and wipe sampling. A total of 36 surface soil samples were collected at the site.

- Surface soil samples were analyzed for PCBs.

A total of twelve wipe samples were collected at the site.

- Wipe samples were analyzed for PCBs.

PCBs (Aroclor-1254 and -1260) were detected at concentrations exceeding risk-based screening levels in surface soil. As a result, an HHRA was performed (EA, 1999b). The HHRA determined that there were unacceptable risks for future construction/excavation workers, current and future commercial/industrial workers, and future resident adults and children exposed to surface soil at the site. Aroclor-1254 and -1260 were identified as COCs that posed unacceptable risks. RGs were developed for Aroclor-1254 and -1260 (combined) in surface soil to reduce risks to future residential receptors to within acceptable risks levels (see table below).
An ERA was not performed for Site 34 because of its small size (two concrete pads) land lack of suitable habitat (EA, 1999b). The site is located in the developed portion of the Main Base, and

contains little onsite vegetation or habitat that would be expected to attract animal life. As such, the exposure pathway to potential ecological ROCs is incomplete.

Based on recommendations in the EE/CA (EA, 1999b), a removal action was completed at Site 34 to reduce risks associated with potential human exposures to PCBs. The removal action was successfully implemented as a non-time-critical response action using a USEPA-approved presumptive remedy approach, and the details are provided in the RVR (GTI, 2003) and RI (EA, 2007) documents.

The removal action (limited soil and concrete removal) was conducted during two phases, November 1999 through January 2000 and February 2002 through October 2002. A total of 298 lcy of soil and 27 lcy of concrete contaminated with PCBs, at concentrations below 50 mg/kg, and 4 lcy of soil and concrete contaminated with PCBs, at concentrations above 50 mg/kg, were removed from five hot spots on the site (Figure 2-6). The soil and concrete with PCB concentrations below 50 mg/kg was transported to the Andersen AFB Sanitary Landfill for disposal. The soil and concrete characterized as TSCA-regulated PCB waste (PCBs above 50 mg/kg) was transported off-island to a permitted facility for disposal (GTI, 2003).

REMOVAL ACTION CLEANUP LEVELS FOR SITE 34, ANDERSEN AFB, GUAM.

COC	Cleanup Level [(a)] (mg/kg)	RG (mg/kg)
Aroclor-1254	0.35	0.35
Aroclor-1260	0.35	0.35
Total Aroclors	0.70	0.70

Definitions:
(a) The cleanup level is the RG.
mg/kg = milligram per kilogram
RG = Remedial Goal
COC = Contaminant of Concern

Confirmation soil samples were collected from the excavated areas and results were below the project-specific RGs; the removal action achieved levels approved for residential land use (protective of 1×10^{-5} excess cancer risk). Risks to human receptors (future resident adults and children—the most conservative receptor population) were reduced to levels acceptable for unlimited use of and unrestricted access to the land.

A CERCLA "No Action" decision is deemed appropriate for Site 34, and no FS is required.

2.5.6 Nature and Extent of Contamination

Site 4

Surface and subsurface soils were evaluated for potential contamination from historical landfill activities at the site. Results of the HHRA and ERA concluded that COPCs present at Site 4 do not present unacceptable risks to ecological or human receptors (future resident adults and

children—the most conservative receptor population), which allows for unlimited use of and unrestricted access to the land (EA, 2007).

Site 11

Surface and subsurface soils were evaluated for potential contamination from historical landfill activities at the site. Results of a PRE concluded that COPCs present at Site 11 do not present unacceptable risks to ecological or human receptors (future resident adults and children—the most conservative receptor population), which allows for unlimited use of and unrestricted access to the land (EA, 2007). An ERA was not performed at the site due to the lack of suitable habitat for ecological receptors.

Site 25

Surface and subsurface soils were evaluated for potential contamination from historical use as a drum storage area and a burn pit. Results of the HHRA concluded that COPCs present at Site 25 do not present unacceptable risks to ecological or human receptors (future resident adults and children—the most conservative receptor population), which allows for unlimited use of and unrestricted access to the land (EA, 2007). An ERA was not performed at the site due to the lack of suitable habitat for ecological receptors.

Site 28

Surface and subsurface soils were evaluated for potential contamination from historical disposal activities at the site. Results of the HHRA and ERA concluded that COPCs present at Site 28 do not present unacceptable risks to ecological or human receptors (future resident adults and children—the most conservative receptor population), which allows for unlimited use of and unrestricted access to the land (EA, 2007).

Site 34

Surface soils were evaluated for potential contamination from historical PCB-containing transformer storage activities at the site. Based on the HHRA in the NFRAP document (EA, 1999b), unacceptable risks were identified for future construction workers, current and future commercial/industrial workers, and future resident adults and children exposed to surface soil at Site 34. Aroclor-1254 and -1260 were identified as COCs that posed unacceptable risks. An ERA was not performed for Site 34 because of its small size (two concrete pads) and due to the lack of suitable habitat for ecological receptors.

The contaminants (PCBs) at Site 34 have been successfully removed through implementation of a removal action. The non-time-critical removal action used a USEPA-approved presumptive remedy approach. The removal action included PCB-contaminated soil at concentrations exceeding 0.70 mg/kg for Aroclor-1254 and -1260 combined. All final confirmation soil sample results were reported to be below the project-specific RGs. This resulted in a reduction in risks to human receptors (future resident adults and children) to acceptable risk levels, thus allowing for unlimited use and unrestricted access to the land (EA, 2007).

2.5.7 Conceptual Site Model

Conceptual site models (CSMs) were developed for Sites 4, 11, 25, 28, and 34 to depict the potential relationship or exposure pathway between chemical sources and receptors. An exposure pathway describes the means by which a receptor can be exposed to contaminants in environmental media. These pathways are presented in Figures 2-12 through 2-17, based upon current and reasonably likely future land uses and the potential beneficial use of groundwater and surface water at Sites 4, 11, 25, 28, and 34.

Although future residential land use is considered unlikely at Sites 4, 11, 25, 28, and 34, residential land use has been considered in the HHRAs to determine whether the site would be suitable for unrestricted use or unlimited exposure, as described within this ROD.

2.6 Current and Potential Future Land and Resource Uses

2.6.1 Land Use

Site 4

Site 4 is currently designated as open space (USAF, 2006). Building 14000, currently used as a training area for gas masks, is located just north of the site. As the lead agency, the USAF has the authority to determine the future anticipated land use, and has determined that Site 4 will remain open space for the foreseeable future.

Land adjacent to and surrounding Site 4, east of the Andersen AFB boundary is currently designated as open space and for industrial use. Land to the west of the Andersen AFB boundary, across Route 9, is rural residential land. The current use of adjacent and surrounding land is expected to remain the same for the foreseeable future.

Site 11

Site 11 is currently designated for Aircraft Operations and Maintenance land use (USAF, 2006). Site 11 is located approximately 1,800 feet north of the flight line and adjacent to the WSA. The site is undeveloped and unfenced. Because of its proximity to the active flight line and because it lies within the Explosive Quantity Distance Range (EQDR), the site is expected to have minimal usage. As the lead agency, the USAF has the authority to determine the future anticipated land use, and has determined that land use at Site 11 will remain the same for the foreseeable future.

Land located to the north of Site 11 is designated as open space. Land to the south of Site 11 is designated for Aircraft Operations and Maintenance land use. The current use of adjacent and surrounding land is expected to remain the same for the foreseeable future.

Site 25

Site 25 is currently used as a storage area for War Readiness Materials and contingency transportation vehicles, and is located in an area designated as Aircraft Operations and Maintenance under the General Plan Land Use Categories (USAF, 2006). As the lead agency, the USAF has the authority to determine the future anticipated land use, and has determined that

land use at Site 25 will remain the same for the foreseeable future.

Land adjacent to and surrounding Site 25 is also designated as Aircraft Operations and Maintenance under the General Plan Land Use Categories (USAF, 2006). Land use is designated as open space approximately 2,500 feet north of Site 25. The active airfield lies approximately 500 feet to the south of Site 25. The current use of adjacent and surround land is anticipated to remain the same for the foreseeable future.

Site 28

Site 28 is located near the end of the active south runway and is currently designated as open space (USAF, 2006). The proximity of the site to the runways acts as a deterrent to individuals who may wander onto the property. Site 28 is not actively in use and is rarely visited by anyone other than the United States Department of Agriculture personnel that tend brown tree snake traps located along the flight line perimeter fence. As the lead agency, the USAF has the authority to determine the future anticipated land use, and has determined that land use at Site 28 will remain the same for the foreseeable future.

Land adjacent to and surrounding Site 28 to the north, east, and south of the site is designated as open space (USAF, 2006). An active airfield is located to the west of the site. Land use of the adjacent and surrounding land is expected to remain the same for the foreseeable future.

Site 34

Site 34 is currently designated for industrial land use (USAF, 2006) and has two buildings located on the site. Building 20012, built in 2004, houses the 36th Air Mobility Response Squadron Warehouse. Building 20018, built in 2006, houses the Federal Bureau of Investigation Forward Command Support Warehouse and is unoccupied. Both of these buildings are designed for warehousing equipment and supplies, not for continuous occupation by workers. Occasionally, on the order of a few days per year, workers conduct light maintenance activities on equipment stored in Building 20012. As the lead agency, the USAF has the authority to determine the future anticipated land use, and has determined that the current land use of Site 34 will remain the same for the foreseeable future.

Land located to the north of Site 34 is designated for use as Aircraft Operations and Maintenance, while land immediately east, south, and west of the site is designated for industrial use. Land further to the east and to the south (approximately 500 feet) is designated as open space (USAF, 2006). Land use of the adjacent and surrounding areas is expected to remain the same for the foreseeable future.

2.6.2 Ground and Surface Water Uses

All sites covered under this ROD are located on the Northern Guam Lens aquifer, which is designated by the USEPA as a sole source aquifer, and supplies Guam with approximately 80% of its drinking water (Barrett, 1982). Groundwater at the Main Base OU has been monitored regularly as part of the Long-term Groundwater Monitoring Program at Andersen AFB (EA, 2006). The initial round of groundwater sampling was conducted for all the Main Base

monitoring wells in November 1995 (Round 1) and on a semiannual basis (twice a year) thereafter.

The historical groundwater data set for the Main Base has established that there is no connection between the COCs observed in the surface and subsurface soils in the five IRP sites covered under this ROD and any groundwater contamination. TCE and tetrachloroethene (PCE) have been observed in groundwater samples collected from Main Base monitoring wells at concentrations exceeding the Federal Safe Drinking Water Act's Maximum Contaminant Levels (MCLs). However, the groundwater contamination has been attributed to a likely TCE/PCE source(s) in the vicinity of Building 18006. The following section provides a short narrative for each site.

Site 4

Twenty-one rounds of groundwater sampling have been conducted at the one monitoring well nearest to Site 4 (IRP-59, located cross-gradient of the site). No VOC, SVOC, PAH, pesticide, or metal constituents have been detected at concentrations exceeding MCLs (EA, 2006). Based on the historical groundwater monitoring results, depth to groundwater (approximately 350 feet bgs), and the low concentrations of target analytes detected in surface and subsurface soils at Site 4, it is concluded that Site 4 has not and will not have a negative impact on the aquifer.

Site 11

Sixteen rounds of groundwater sampling have been conducted at the one monitoring well nearest to Site 11 (IRP-52, located cross-gradient to upgradient of the site). No VOC, SVOC, PAH, pesticide, or metal constituents have been detected at concentrations exceeding the MCLs (EA, 2006). Based on the historical groundwater monitoring results, depth to groundwater (approximately 535 feet bgs), and the low concentrations of target analytes detected in surface and subsurface soils at Site 11, it is concluded that Site 11 has not and will not have a negative impact on the aquifer.

Site 25

Sixteen rounds of groundwater sampling have been conducted at the monitoring wells nearest to Site 25 (IRP-52, located cross-gradient, and USGS-75, located upgradient of the site). No VOC, SVOC, PAH, pesticide, or metal constituents have been detected at concentrations exceeding the MCLs (EA, 2006). Based on depth to groundwater (approximately 535 feet bgs), and the low concentrations of target analytes detected in surface and subsurface soils at Site 25, it is concluded that Site 25 has not and will not have a negative impact on the aquifer.

Site 28

Eighteen rounds of groundwater sampling have been conducted at the one monitoring well nearest to Site 28 (IRP-42, located cross-gradient of the site). No VOC, SVOC, PAH, or pesticide constituents have been detected at concentrations exceeding the MCLs (EA, 2006). Chromium was detected at concentrations exceeding the MCL (maximum detected concentration of 143 micrograms per liter [μg/L] versus MCL of 100 μg/L) in three sampling events; however,

the chromium was attributed to corrosion of the stainless steel screen and pump (EA, 1997). Based on the historical groundwater monitoring results, depth to groundwater (approximately 580 feet bgs), and the low concentrations of target analytes detected in surface and subsurface soils at Site 28, it is concluded that Site 28 has not and will not have a negative impact on the aquifer.

Site 34

Eighteen rounds of groundwater sampling have been conducted at the monitoring wells nearest to Site 34 (IRP-42, located cross-gradient of the site, as well as IRP 51 and USGS-150, located downgradient of the site). No constituents related to Site 34 (PCB Aroclors) have been detected (EA, 2006). Based on the historical groundwater monitoring results, depth to groundwater (approximately 600 feet bgs), and the concentrations of PCBs detected in surface soils at Site 35, as well as their relatively low solubility and mobility, it is concluded that Site 34 has not and will not have a negative impact on the aquifer.

2.7 Summary of Site Risks

This section includes the basis for no further action at Sites 4, 11, 25, 28, and 34, and brief summaries of the updated HHRA for Sites 4, 25, 28, and 34; PRE for Site 11; and ERA for Sites 4 and 28, as presented in the RI (EA, 2007).

The RI included updated risk assessments for Sites 4, 11, 25, 28, and 34 to confirm that no additional risks existed as a result of changes in screening criteria, other than those identified previously in each site's corresponding EE/CA or NFRAP documents. The updates to the HHRAs, PRE, and ERAs included reevaluating historic site data with respect to the currently accepted background threshold values (BTVs) for naturally occurring compounds, PRGs, and current exposure factor parameters used to model risk (e.g., dermal absorption rates and slope factor [SF]).

During completion of the HHRA, risks for cancer COPCs and non-cancer COPCs were calculated separately, and the risks for each were then summed to determine cumulative risks. For cumulative cancer risks, the USEPA has established an acceptable risk level of 10^{-6}, which represents a one-in-a-million increase in the lifetime cancer risk for the evaluated receptor (e.g., a resident or a site worker) if exposed to the site COPCs. The USEPA has determined increased cancer risk in excess of 10^{-4} (one-in-ten-thousand) is unacceptable. The risk range of 10^{-6} to 10^{-4} may be evaluated in the risk management context to determine whether risk is acceptable for future site conditions (such as land use and potential users). For cumulative non-cancer risks, the USEPA has established a Hazard Index (HI) less than 1.0 as acceptable.

Because there are no unacceptable risks to receptor populations remaining at the sites 4, 11, 25, 28, or 34, the risk assessment summary sections for these sites are brief. A more detailed description of the PRE/HHRA process is located in the RI document (EA, 2007).
Updated ERAs were not conducted for Sites 11, 25, and 34 due to the lack of suitable habitat to support ecological ROCs, therefore resulting in incomplete exposure pathways.

Uncertainties in Risk Characterization

Uncertainties in the risk characterization can stem from the inherent uncertainties in the data evaluation; the exposure assessment process, including any modeling of exposure point concentrations (EPCs) in secondary media from primary media; and the toxicity assessment process. The individual uncertainties in these respective processes are addressed in Appendix A.

2.7.1 Site 4

This section summarizes the approaches and findings of the HHRA and ERA performed for Site 4 (Sections 2.7.1.1 and 2.7.1.2, respectively) (EA, 2000a; EA, 2007). The CSMs developed for the HHRA and ERA are presented in Figures 2-12 and 2-13, respectively.

2.7.1.1 Summary of Human Health Risk Assessment for Site 4

Initially, a baseline HHRA was performed for Site 4 as an element of the NFRAP document (EA, 2000a). The 2007 RI updated the HHRA and ERA and reevaluated historic site data with respect to the currently accepted BTVs for naturally occurring compounds, PRGs, and current exposure factor parameters used to model risk (e.g., dermal absorption rates and cancer SFs).

The purpose of the HHRA was to determine the potential for risks to human health from exposures to chemicals originating from Site 4. The HHRA evaluated whether current and future land use patterns at Site 4 pose unacceptable risks to human health under specified exposure conditions. Potential receptors at the site include occasional users/trespassers. Andersen AFB future land reuse plans do not include future residential reuse of Site 4 due to its proximity to the Base Sanitary Landfill. Therefore, it is expected that future residential exposures are highly unlikely. However, future onsite resident adults and children were evaluated as potential receptors, as a conservative measure.

Under current use conditions at the site, the only potential receptors are occasional users/trespassers. There are no unacceptable risks to this receptor scenario. Therefore, there are no cleanup goals required and no remedial action is necessary to be protective of current use receptors at the site.

Under the unlikely future scenario of residential use, one COPC (aluminum) was identified as posing potential unacceptable non-cancer risk to future resident children exposed to surface soil at the site. However, aluminum concentrations present at Site 4 were determined to be representative of background concentrations. The HHRA therefore determined that there are no concerns for adverse non-cancer risks for future resident children at Site 4. No further risks to any current or potential receptor groups were identified.

Since no unacceptable risk to public health was identified at Site 4, no further action is proposed for this site and no FS is required.

2.7.1.2 Summary of Ecological Risk Assessment for Site 4

This section summarizes the approaches and findings of the ERA performed for Site 4 (EA, 2000a; EA, 2007). The ERA did not find any unacceptable risks associated with contaminants present at Site 4.

The ERA did not identify any COCs at Site 4. Four COPCs were identified through the initial

screening process; aluminum, beryllium, cadmium, and vanadium. Further evaluation of COPCs with respect to exposure medium, toxicity data, and relevant receptor populations effectively eliminated all COPCs from consideration as COCs. No contaminants were identified at Site 4 that posed unacceptable risk to ecological receptors.

Based on the lack of unacceptable risks to any of the ROCs, remedial action is not being recommended to reduce site risks.

Surface soil was determined to be the only complete exposure pathway for ecological receptors at Site 4. To identify COPCs for the ERA at Site 4, the maximum detected concentration for each chemical in surface soil was compared to the higher of (1) conservative toxicologically based screening criteria or (2) BTVs for inorganic contaminants (ICF, 1997; Andersen AFB, 2001). A contaminant was excluded as a COPC if the maximum detected concentration at Site 4 was lower than the screening value, or the contaminant was an essential nutrient. Screening values were based on conservative thresholds of ecological risk as recommended by the Dutch National Institute of Public Health and Environmental Protection (Dutch, 1994; Dutch, 1995).

Based on this protocol, most contaminants were excluded, but four inorganic contaminants were designated as COPCs: aluminum, beryllium, cadmium, and vanadium. No organic contaminant was designated as a COPC.

These COPCs remaining after the initial screening required additional evaluation of fate and transport, exposure, and potential risk to ecological receptors.

ROCs were identified for Site 4 based on the results of an ecological field survey that was conducted in December 1998. Site 4 is approximately 14.5 acres and includes three major habitats: grassland, mixed herbaceous vegetation, and active base/maintained areas. The ROCs identified for Site 4 consisted of the yellow bittern, terrestrial plants, and terrestrial invertebrates (represented by earthworms).

Based on a combination of qualitative assessment and quantitative risk characterization, COPCs at Site 4—aluminum, beryllium, cadmium, and vanadium—were determined not to pose any unacceptable risk to ecological receptors. Given the "negligible potential for risk" (USEPA, 1997a), no further ecological evaluation is required.

2.7.2 Site 11

This section summarizes the approaches and findings of the PRE performed for Site 11 (EA, 1999a; EA, 2007).

2.7.2.1 Summary of Preliminary Risk Evaluation for Site 11

Initially, a PRE was performed for Site 11 as an element of the NFRAP document (EA, 1999a). The 1999 risk evaluation identified a number of COPCs in the surface and subsurface soil. The 2007 RI updated the risk evaluation, and reevaluated historic site data with respect to the currently accepted BTVs for naturally occurring compounds, PRGs, and current exposure factor parameters used to model risk (e.g., dermal absorption rates and cancer SFs).

The purpose of the PRE was to determine the potential for risks to human health from exposures to chemicals originating from Site 11. The PRE evaluated whether current and future land use at Site 11 pose unacceptable risks to human health under specified exposure conditions. Potential receptors at the site include occasional users/trespassers. Andersen AFB future land reuse plans do not include development, and given its unique location within the EQDR, and its proximity to the active flight line, the site is not suitable for future residential development. Therefore, it is expected that future residential exposures are highly unlikely. However, future onsite residents were evaluated as potential receptors, as a conservative measure.

Under current use conditions at the site, the only potential receptors are occasional users/trespassers. For this receptor group, benzo(b)fluoranthene and benzo(a)pyrene were identified as COPCs in surface soil, and chromium was identified as a COPC in subsurface soil. Based on the results of the PRE, there are no unacceptable risks to this receptor group posed by the COPCs identified at the site. Therefore, no remedial action is recommended.

Under the unlikely future scenario of residential use, benz(a)anthracene, benzo(b)fluoranthene, and benzo(a)pyrene were identified as COPCs for residents exposed to surface soil, and chromium and thallium were identified as COPCs for residents exposed to subsurface soil. The results of the PRE concluded that there are no unacceptable risks to this receptor group posed by the COPCs identified at the site. Therefore, no remedial action is recommended.

Since no unacceptable risk to public health was identified at Site 11, no further action is proposed for this site and no FS is required.

2.7.2.2 Summary of Ecological Risk Assessment for Site 11

An ERA was not conducted at Site 11 because the site occupies a relatively small area within the developed portion of the Main Base that does not currently constitute suitable habitat for ecological receptors. In addition, future development in this area will likely be for industrial use due to its proximity to the active runway.

2.7.3 Site 25

This section summarizes the approaches and findings of the HHRA performed for Site 25 (EA, 2001; EA, 2007). The CSM developed for the HHRA is presented in Figure 2-14.

2.7.3.1 Summary of Human Health Risk Assessment for Site 25

Initially, a baseline HHRA was performed for Site 25 as an element of the NFRAP document (EA, 2001). The 2007 RI updated the HHRA, and reevaluated historic site data with respect to the currently accepted BTVs for naturally occurring compounds, PRGs, and current exposure factor parameters used to model risk (e.g., dermal absorption rates and cancer SFs).

The purpose of the HHRA was to determine the potential for risks to human health from exposures to chemicals originating from Site 25. The HHRA evaluated whether current and future land use at Site 25 pose unacceptable risks to human health under specified exposure conditions. Potential receptors at the site include occasional users/trespassers. Andersen AFB

future land reuse plans do not include development, and given its proximity to the active runway, the site is not suitable for future residential development. Therefore, it is expected that future residential exposures are highly unlikely. However, future onsite resident adults and children were evaluated as potential receptors, as a conservative measure.

Under current use conditions at the site, the only potential receptors are occasional users/trespassers. COPCs identified at the site were determined to pose no unacceptable risks to this receptor group. Therefore, no cleanup goal is required and no remedial action is necessary to be protective of current use receptors at the site.

COPCs identified at the site were determined to pose no unacceptable risks to the unlikely future residential adult/child receptor group. Therefore, no cleanup goal is required and no remedial action is necessary to be protective of potential future use receptors at the site.

Since no unacceptable risk to public health was identified at Site 25, no further action is proposed for this site and no FS is required.

2.7.3.2 Summary of Ecological Risk Assessment for Site 25

Site 25 is located within the developed portion of the Main Base. Asphalt pavement and Building 51104 cover the majority of Site 25 and it does not constitute suitable habitat for ecological receptors. In addition, future development in this area will likely be for industrial use due to it's proximity to the active runway. Therefore, no ERA was conducted for Site 25.

2.7.4 Site 28

This section summarizes the approaches and findings of the HHRA and ERA performed for Site 28 (EA, 2000b; EA, 2007). The CSMs developed for the HHRA and ERA are presented in Figures 2-15 and 2-16, respectively.

2.7.4.1 Summary of Human Health Risk Assessment for Site 28

Initially, a baseline HHRA was performed for Site 28 as an element of the NFRAP document (EA, 2000b). The 2007 RI updated the HHRA and ERA and reevaluated historic site data with respect to the currently accepted BTVs for naturally occurring compounds, PRGs, and current exposure factor parameters used to model risk (e.g., dermal absorption rates and cancer SFs).

The purpose of the HHRA was to determine the potential for risks to human health from exposures to chemicals originating from Site 28. The HHRA evaluated whether current and future land use patterns at Site 28 pose unacceptable risks to human health under specified exposure conditions. Potential receptors at the site include occasional users/trespassers. Andersen AFB future land reuse plans do not include future residential reuse of Site 28 due to its proximity to the active flight line. Therefore, it is expected that future residential exposures are highly unlikely. However, future onsite resident adults and children were evaluated as potential receptors, as a conservative measure.

Under current use conditions at the site, the only potential receptors are occasional users/trespassers. COPCs identified at the site were determined to pose no unacceptable risks to this receptor group. Therefore, no cleanup goal is required and no remedial action is necessary to be protective of current use receptors at the site.

COPCs identified at the site were determined to pose no unacceptable risks to the unlikely future residential adult/child receptor group. Therefore, no cleanup goal is required and no remedial action is necessary to be protective of potential future use receptors at the site.

Although the risk assessment identified no unacceptable risks to human health or the environment at the site, a removal action (battery removal effort) was conducted to remove and dispose of 68 lead-acid aircraft batteries that had been discovered during the field investigation.

Since no unacceptable risk to public health was identified at Site 28, no further action is proposed for this site and no FS is required.

2.7.4.2 Summary of Ecological Risk Assessment for Site 28

This section summarizes the approaches and findings of the ERA performed for Site 28 (EA, 2000b; EA, 2007). The ERA identified slight risks related to two COCs at the site, lead and zinc.

Three COPCs were identified through the initial screening process, including cadmium, lead, and zinc. Further evaluation of these COPCs with respect to exposure medium, toxicity data, and relevant receptor populations determined that risks posed by cadmium were acceptable for all ROCs identified. The remaining two COCs were determined to pose only a slight risk to ecological receptors at Site 28.

Based on the negligible risk posed to ROCs, remedial action is not being recommended to further reduce site risks.

Surface soil was determined to be the only environmental medium with complete exposure pathways for ecological receptors at Site 28. To identify COPCs for the ERA at Site 28, the maximum detected concentration for each chemical in surface soil was compared to the higher of (1) conservative toxicologically based screening criteria or (2) BTVs for inorganic contaminants (ICF, 1997; Andersen AFB, 2001). A contaminant was excluded as a COPC if the maximum detected concentration at Site 28 was lower than the screening value, or the contaminant was an essential nutrient. Screening values were based on conservative thresholds of ecological risk as recommended by the Dutch National Institute of Public Health and Environmental Protection (Dutch, 1994; Dutch, 1995).

Based on this protocol, most contaminants were excluded, but three inorganic contaminants were designated as COPCs: cadmium, lead, and zinc. No organic contaminants were designated as COPCs.

These COPCs remaining after the initial screening required additional evaluation of fate and transport, exposure, and potential risk to ecological receptors.

ROCs were identified for Site 28 based on a qualitative habitat and biota survey that was conducted in June of 1999. Site 28 is approximately 3.2 acres and includes two major habitats: mixed herbaceous vegetation and mature limestone forest. The ROCs identified for Site 28 consisted of the Marina crow, Micronesian starling, Mariana fruit bat, yellow bittern, terrestrial

plants, and terrestrial invertebrates (represented by earthworms).

The ERA identified lead and zinc as posing slight risks to terrestrial plants, and lead as posing a slight risk to the Mariana crow and yellow bittern. These risks were based on very small exceedances of screening criteria. Based on the highly conservative nature of the ERA, these risks are most likely overstated. The ERA therefore concluded that given the "negligible potential for risk" (USEPA, 1997a), no further ecological evaluation is required, and no remedial action necessary to protect the environment.

2.7.5 Site 34

This section summarizes the approaches and findings of the HHRA and ERA performed for Site 34 (Sections 2.7.5.1 and 2.7.5.2, respectively) (EA, 1999b; EA, 2007). The CSM developed for the HHRA is presented in Figure 2-17.

2.7.5.1 Summary of Human Health Risk Assessment for Site 34

An HHRA was performed for Site 34 as an element of the EE/CA (EA, 1999b).
Risks were estimated for the following receptor populations at Site 34:

- Future Construction/Excavation Workers
- Current and Future Commercial/Industrial Workers
- Current and Future Occasional Users/Trespassers (Adults)
- Future Residents (Adults and Children)

Under current use conditions at the site, the only potential receptors are occasional users/trespassers and commercial/industrial workers.

The 1999 HHRA identified and further evaluated COCs, as well as the potentially exposed populations and exposure pathways of primary concern. PCBs (Aroclor-1254 and -1260) posed unacceptable non-cancer risks under the current/future commercial/industrial worker (HI=2.19), future construction worker (HI=2.19), future resident adult (HI=3.07), and future resident child (HI=27.9) receptor scenarios.

Cumulative cancer risks were determined to be within the risk range of 10^{-6} to 10^{-4} for all current and future receptor populations.

Based on recommendations in the EE/CA, a removal action was performed to reduce risks associated with potential human exposures to COCs identified at the site (GTI, 2003). The removal action was successfully implemented as a non-time-critical removal action using the USEPA-approved presumptive remedy approach (GTI, 2003).

The updated HHRA and ERA performed as part of the RI (EA, 2007) identified no COCs other than those originally identified in the EE/CA and/or addressed by the removal action. Therefore, the conclusions of the updated HHRA support the conclusions of the 1999 EE/CA (EA, 1999b) and removal action (GTI, 2003). As discussed in Section 2.5.5, cleanup levels were established under the EE/CA to address unacceptable risks at the site. The removal action utilized the following cleanup levels:

CLEANUP LEVELS UTILIZED DURING THE REMOVAL ACTION AT SITE 34, ANDERSEN AFB, GUAM

COC	Cleanup Level (mg/kg)	Cleanup Rationale
Aroclor-1254	0.35	HQ = 0.5
Aroclor-1260	0.35	HQ = 0.5
Total Aroclors	**0.70**	**HI = 1.0**
Definitions:		
COC = Contaminant of Concern	HQ = Hazard Quotient	
HI = Hazard Index	mg/kg = milligram per kilogram	

**The cleanup level established for total Aroclors at Site 34 was based on achieving an HI of 1.0, which also resulted in being protective of 10^{-5} resident child cancer risks.

Cleanup levels developed under the EE/CA and implemented in the removal action (EA, 1999b; GTI, 2003) successfully reduced onsite risks to the future resident child receptor (the most conservative receptor population) to levels approved for unrestricted and unlimited access to the site (below 10^{-5} excess cancer risk and the HI=1.0 non-cancer risk threshold). The removal action at Site 34 is summarized in Section 2.5.5.

Since no unacceptable risk to public health or welfare or the environment remains at Site 34, no further action is proposed for this site and no FS is required.

2.7.5.2 Summary of Ecological Risk Assessment for Site 34

An ERA was not performed for Site 34 because of its location within the developed portion of the Main Base, its small size (two concrete pads) and it does not constitute suitable habitat for ecological receptors. In addition, future development in this area will likely be for industrial use due to it's proximity to the active runway.

2.7.6 Basis for No Further Action

No unacceptable risk to public health or welfare or the environment was identified at Sites 4, 11, 25, 28, and 34; therefore, no further action is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

2.8 Statutory Authority Finding

Because the HHRA for Sites 4, 25, 28, and 34; PRE for Site 11; and ERA for Sites 4 and 28 indicate that there are no unacceptable risks to human or ecological receptors, the USAF has determined that no further CERCLA remedial action is necessary at Site 4, 11, 25, 28, or 34. Findings of previous site investigations resulted in NFRAP recommendations at four sites (Sites 4, 11, 25, and 28). An EE/CA previously performed at one site (Site 34) identified unacceptable risks due to onsite contamination that was attributed to prior site activities. The EE/CA established site-specific risk-based RGs to reduce risks to acceptable levels. Subsequently, a non-time-critical removal action was successfully implemented at Site 34 to address the unacceptable risks. Therefore, no further action is required for any of these sites to allow for unrestricted use and unlimited access to the land.

Because there are currently no hazardous substances, pollutants, or contaminants remaining at the sites above levels that would allow for unlimited use and unrestricted exposure, a five-year review is not required.

2.9 Documentation of Significant Changes

The Proposed Plan for Sites 4, 11, 25, 28, and 34 was released for public comment on 26 July 2007. The Proposed Plan identified "No further CERCLA remedial action" as the selected remedy. The USAF reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

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3.0 Responsiveness Summary

This section provides a summary of the public comments regarding the Proposed Plan for remedial action at Sites 4, 11, 25, 28, and 34 at Andersen AFB, Yigo, Guam. At the time of the public review period, the USAF had determined that no further CERCLA remedial action is necessary at Site 4, 11, 25, 28, or 34. Based upon the verbal comments received, the USAF's Proposed Plan was accepted by the public.

3.1 Stakeholder Comments and Lead Agency Responses

There were no verbal comments or questions received during the public meeting specifically related to any of the sites addressed under this ROD. General comments and questions raised during the public meeting as well as their responses are listed below:

Ms. Torres asked if there are records available to demonstrate where contaminated materials were disposed of after site cleanup activities. Mr. Ikehara stated that disposal of cleanup materials is a highly regulated activity that is very carefully documented. Information regarding the disposal of cleanup materials is reported in the final Remediation Verification Reports, which are available to the public through the information repositories or the online administrative record.

Ms. Torres asked if the Air Force is going to investigate health concerns related to individuals who may have been exposed to site contaminants prior to or during remediation activities: Mr. Ikehara responded; it is unfortunately impossible to go back and determine historical health impacts. However, current epidemiological studies can be used to try and determine if there are linkages between present day health concerns and potential historical exposures to contaminants, but it is very difficult to draw any clear one-to-one correlation of cause and effect; we'll do the best we can.

Ms. Brown asked if measures are taken to identify potentially contaminated sites so that the public is aware of there locations. Mr. Ikehara stated that signs were posted at the sites with contact numbers in case people wish to enter those areas. Interested parties can contact the Environmental Office on Andersen and provide them with the site name, whereupon the Environmental Office can identify the risks or hazards posed at the site. Engineering controls such as fencing or soil cover are used at sites that carry significant exposure risk, if deemed necessary.

Ms. Brown asked if there will be any further evaluation of sites with only slight risk or those which have been remediated once they have been closed. Mr. Ikehara responded that CERCLA allows for sites to be reopened if more information is uncovered that indicates that the site still poses significant risk. Andersen Air Force Base is currently scheduled to address all of the IRP sites by the year 2012.

Written comments received during the public comment period will be provided in this section in the Final ROD.

3.2 Technical and Legal Issues

No technical or legal issues were identified during the public review period of the Proposed Plan.

4.0 References

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TABLES

Table 1-1
Data Certification Summary.

Decision Summary Sections	Site 4	Site 11	Site 25	Site 28	Site 34
List of COCs and their respective concentrations	NA	NA	NA	NA	X
Baseline risk represented by the COCs	NA	NA	NA	NA	X
Cleanup levels established for COCs and the basis for these levels	NA	NA	NA	NA	X
How source materials constituting principal threats will be addressed	NA	NA	NA	NA	X
Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessment and ROD	X	X	X	X	X
Potential land and groundwater use that will be available at the site as a result of the selected remedies	X	X	X	X	X
Estimated capital, annual operation and maintenance, and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected	NA	NA	NA	NA	NA
Key factor(s) that led to selecting the remedy (i.e., describe how the selected remedy provides the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting criteria key to the decision)	NA	NA	NA	NA	NA

Notes:
COC = contaminant of concern
NA = not applicable
ROD = Record of Decision

Table 2-1
Public Notification of Document Availability.

Requirement:	Satisfied by:
Notice of availability of the Proposed Plan and RI must be made in a widely-read section of a major local newspaper.	Notice of availability of the proposed Plan was published in the *Marianas Variety* on 30 July 2007.
Notice of availability should occur at least two weeks prior to the beginning of the public comment period.	The public comment period began on 26 July 2007.
Notice of availability must include a brief abstract of the proposed plan which describes the alternatives evaluated and identifies the preferred alternative (NCP Section 300.430(f)(3)(i)(A)).	Notice of availability included all of these components and is included in Appendix B of this ROD.
Notice of availability should consist of the following information: • Site name and location • Date and location of public meeting • Identification of lead and support agencies • Alternatives evaluated in the detailed analysis • Identification of preferred alternative • Request for public comments • Public participation opportunities including: o Location of information repositories and AR file o Methods by which the public may submit written and oral comments, including a contact person o Dates of public comment period o Contact person for the Restoration Advisory Board	See notice in Appendix B.

Notes:
AR = Administrative Record
NCP = National Oil and Hazardous Substances Pollution Contingency Plan of 1990
RI = Remedial Investigation
ROD = Record of Decision

Table 2-2
Public Comment Period Requirements.

Requirement:	Satisfied by:
Lead agency (USAF) should make document available to public for review on same date as newspaper notification.	Document was made available to the public on 26 July 2007. The notification of availability was made on 30 July 2007.
Lead agency (USAF) must ensure that all information that forms the basis for selecting the response action is included as part of the AR file and made available to the public during the public comment period.	The USAF maintains information repositories for the Andersen AFB AR file at the Robert F. Kennedy Library at the University of Guam and the Nieves M. Flores Memorial Library in Hagåtña. In addition, the AR file for Andersen AFB is also available on the web at: www.adminrec.com. Data and supporting CERCLA primary documents produced for Andersen AFB are maintained as part of these files and are available to the public.
CERCLA Section 177(a)(2) and NCP Section 300.430(f)(3)(i) requires the lead agency (USAF) to provide the public with a reasonable opportunity (30 days) to submit written and oral comments on the Proposed Plan.	The USAF provided a public comment period for the RI and the Proposed Plan from 26 July 2007 to 26 August 2007.
The lead agency (USAF) must extend the public comment period by at least 30 additional days upon timely request.	The USAF received no requests to extend the public comment period.
The lead agency (USAF) must provide a public meeting to be held at or near the site during the public comment period. A transcript of this meeting must be made available to the public and be maintained in the AR for the site (pursuant to NCP Section 300.430(f)(3)(i)(E)).	A public meeting was held on 2 August 2007 at the Guam Marriott Resort and Spa in Tumon. A transcript of this meeting has been added to the AR file.

Notes:
AFB = Air Force Base
AR = Administrative Record
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980
NCP = National Oil and Hazardous Substances Pollution Contingency Plan of 1990
RI = Remedial Investigation
USAF = United States Air Force

FIGURES

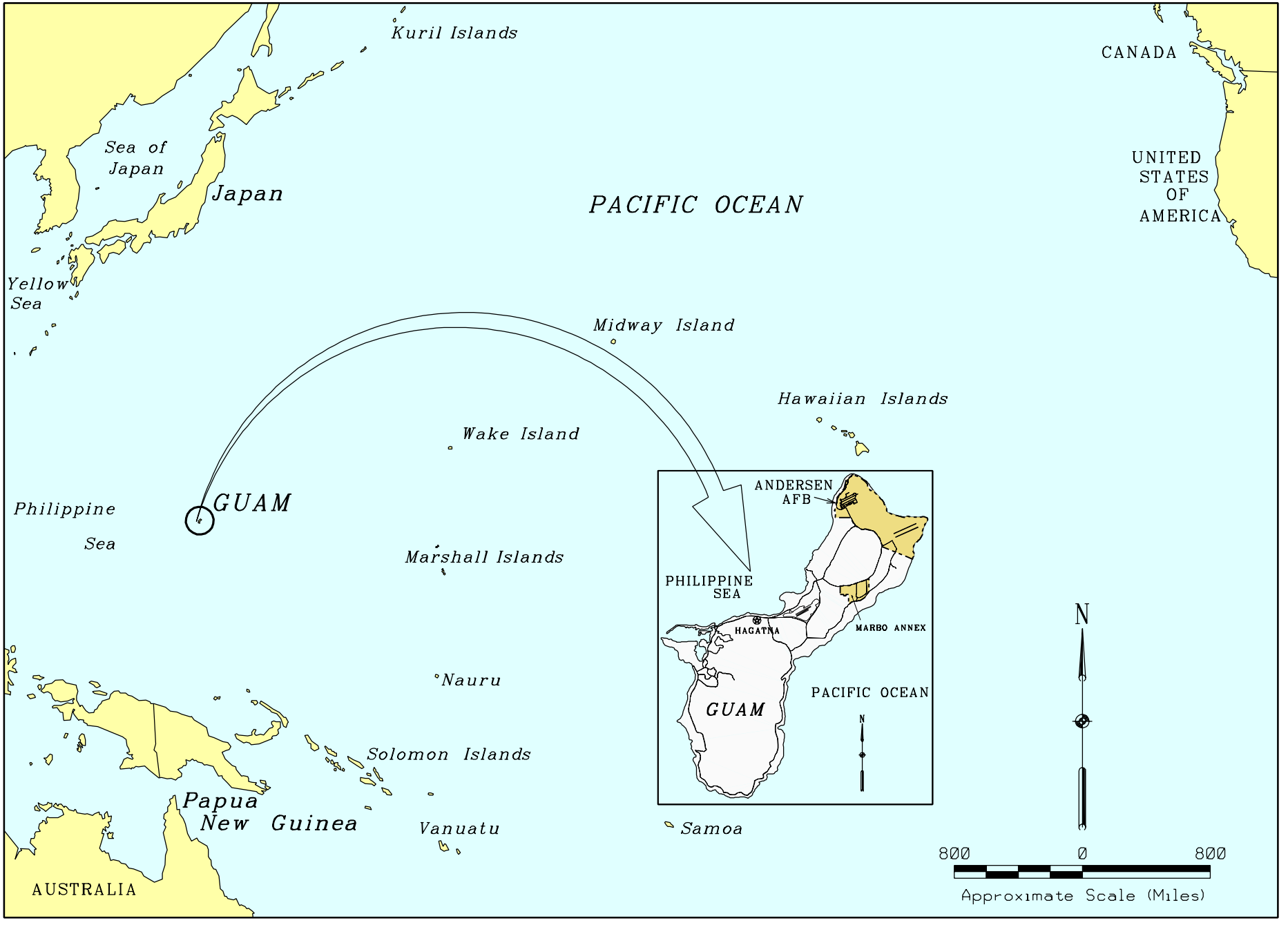


Figure 1-1. Location Map of Guam.

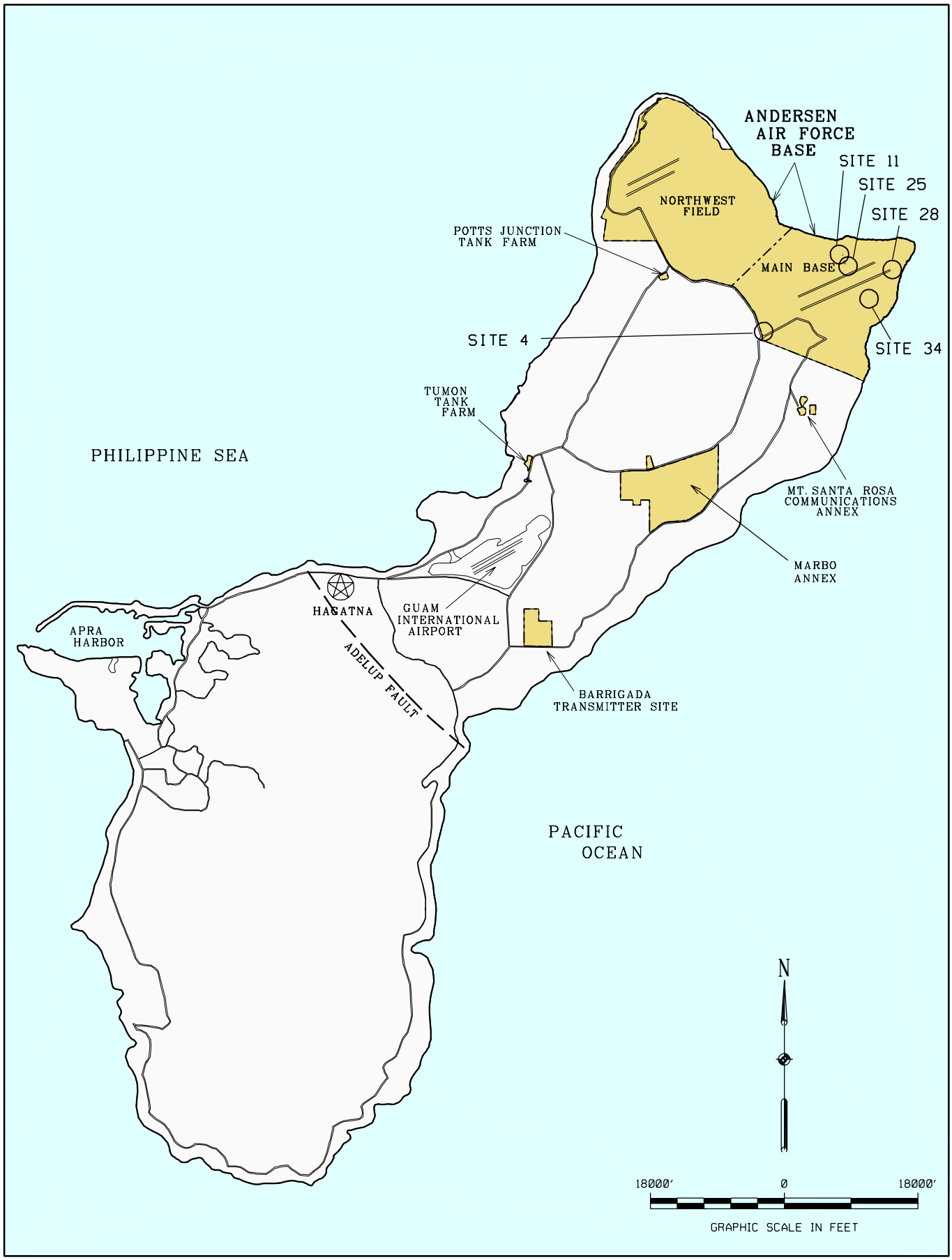


Figure 1-2. Location Map of Andersen Air Force Base on Guam.

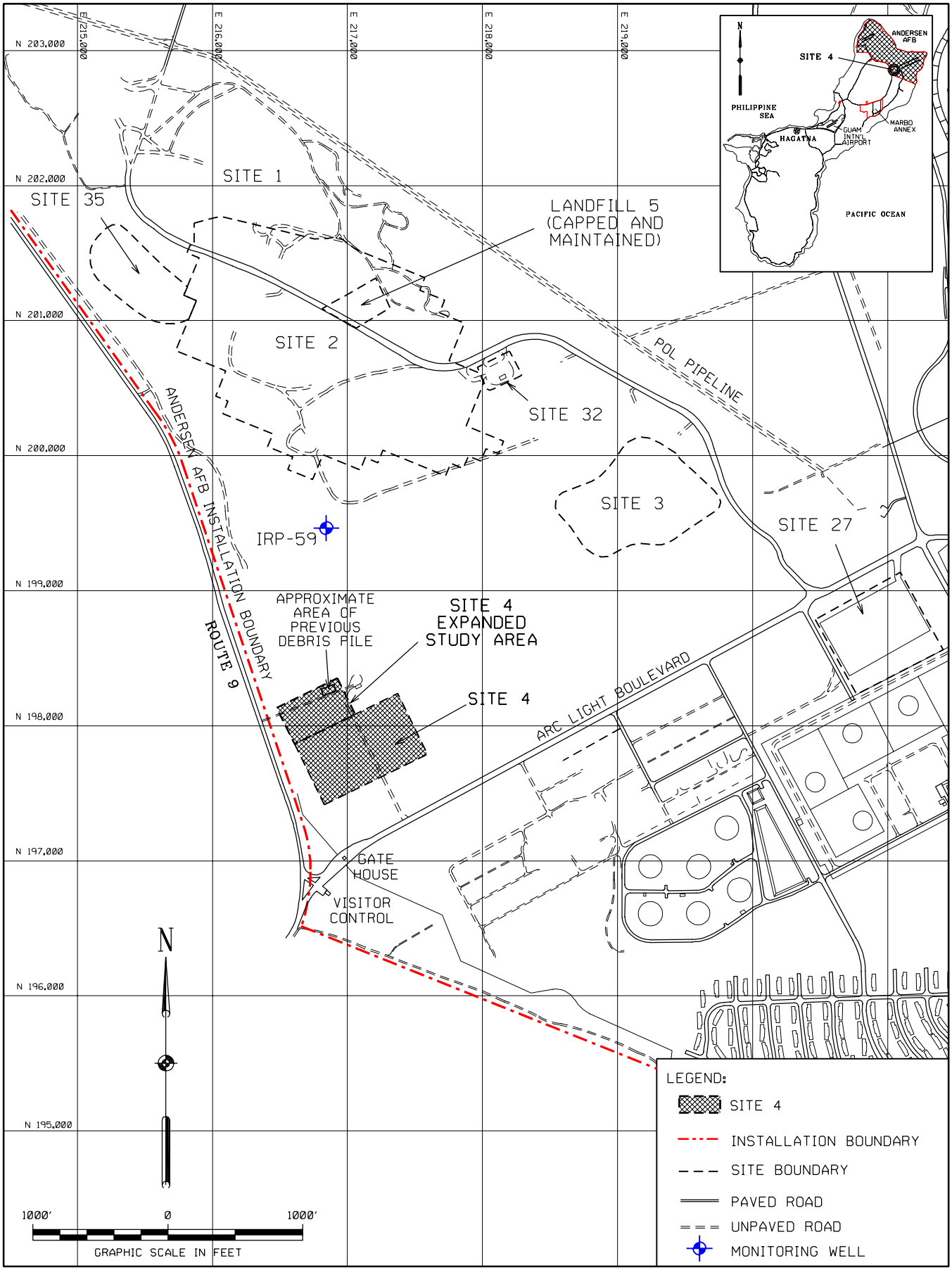


Figure 2-1. Location Map of Site 4, Main Base, Andersen AFB, Guam.

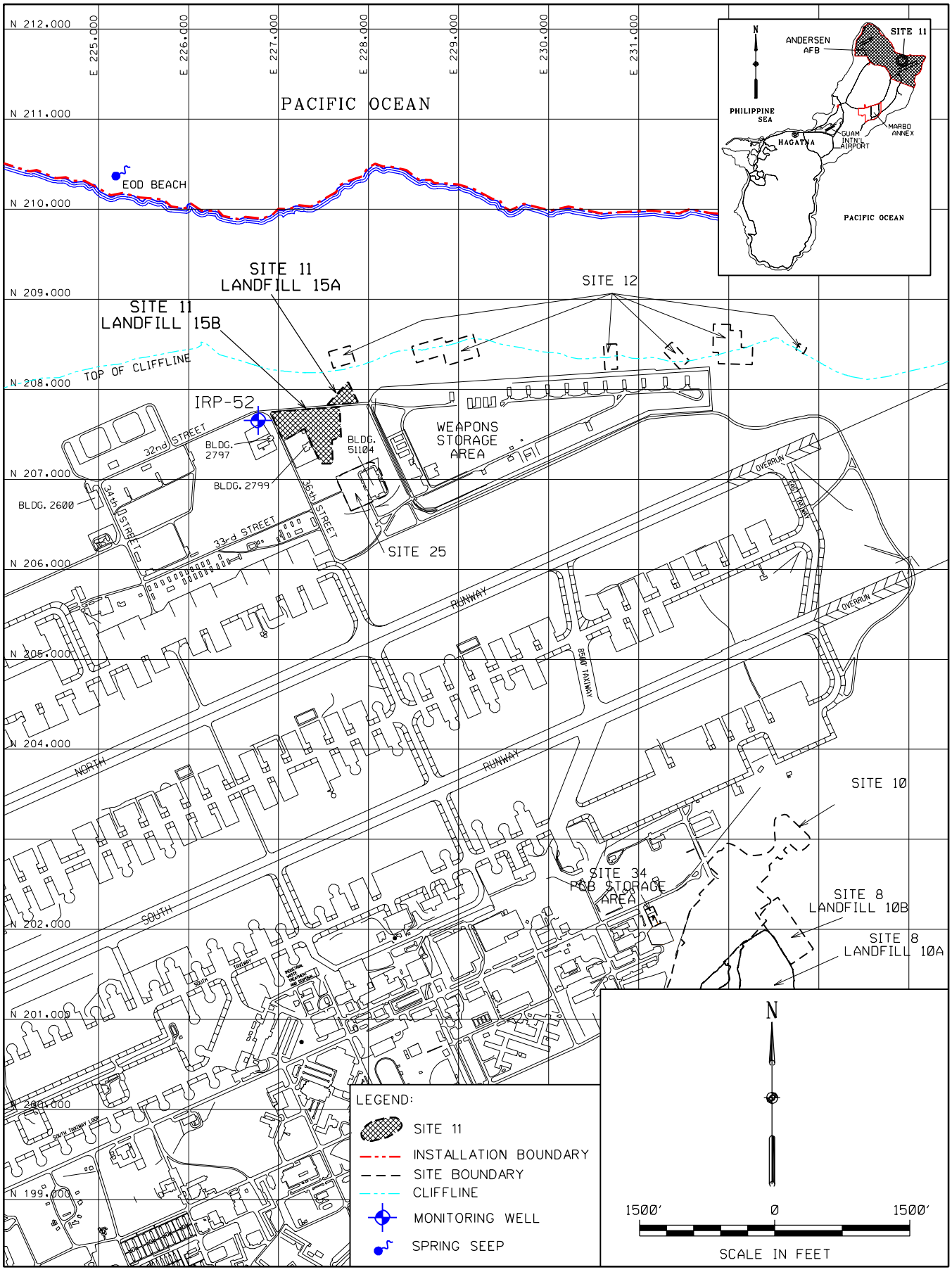


Figure 2-2. Location Map of Site 11, Main Base, Andersen AFB, Guam.

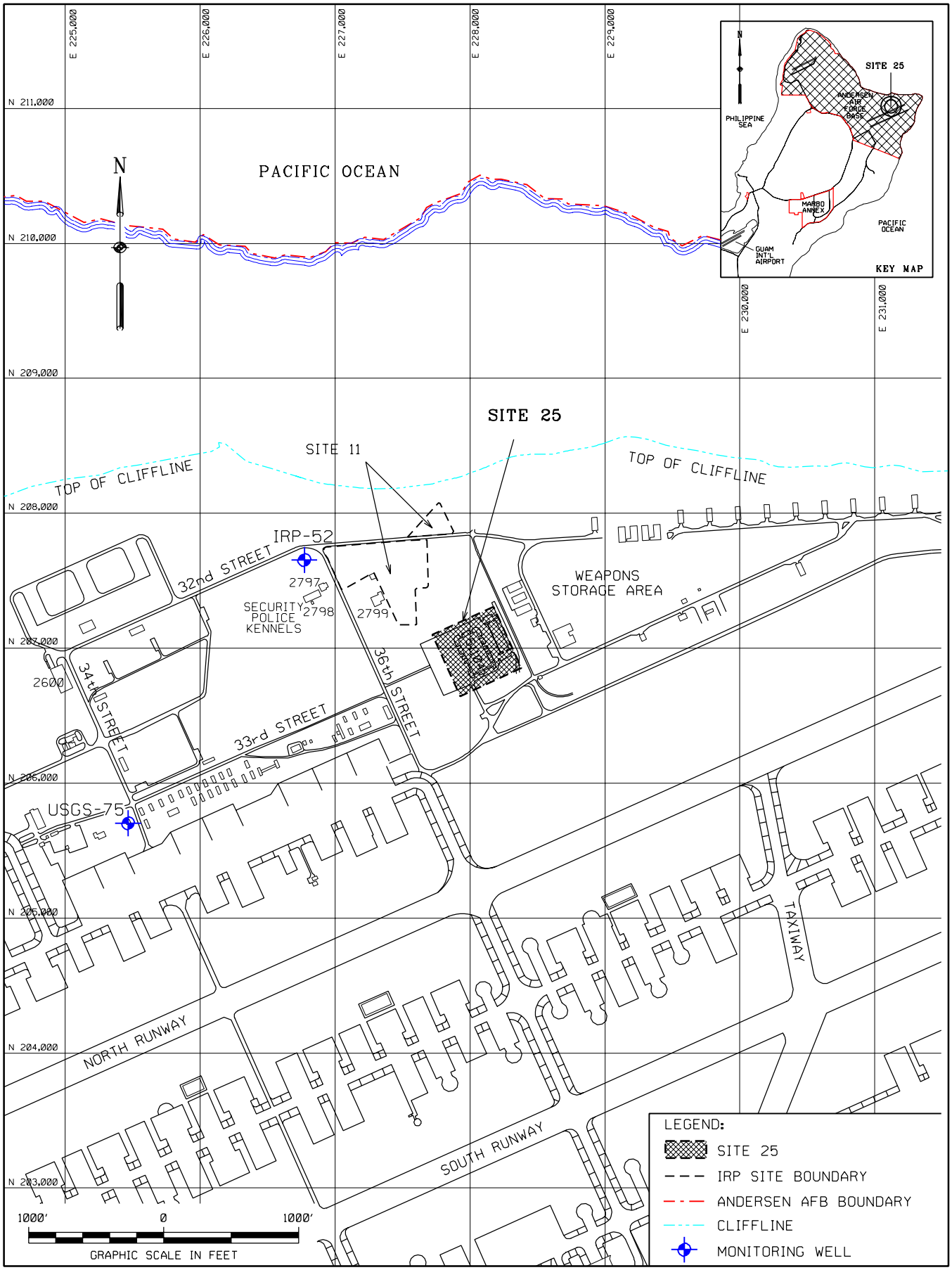


Figure 2-3. Location Map of Site 25, Main Base, Andersen AFB, Guam.

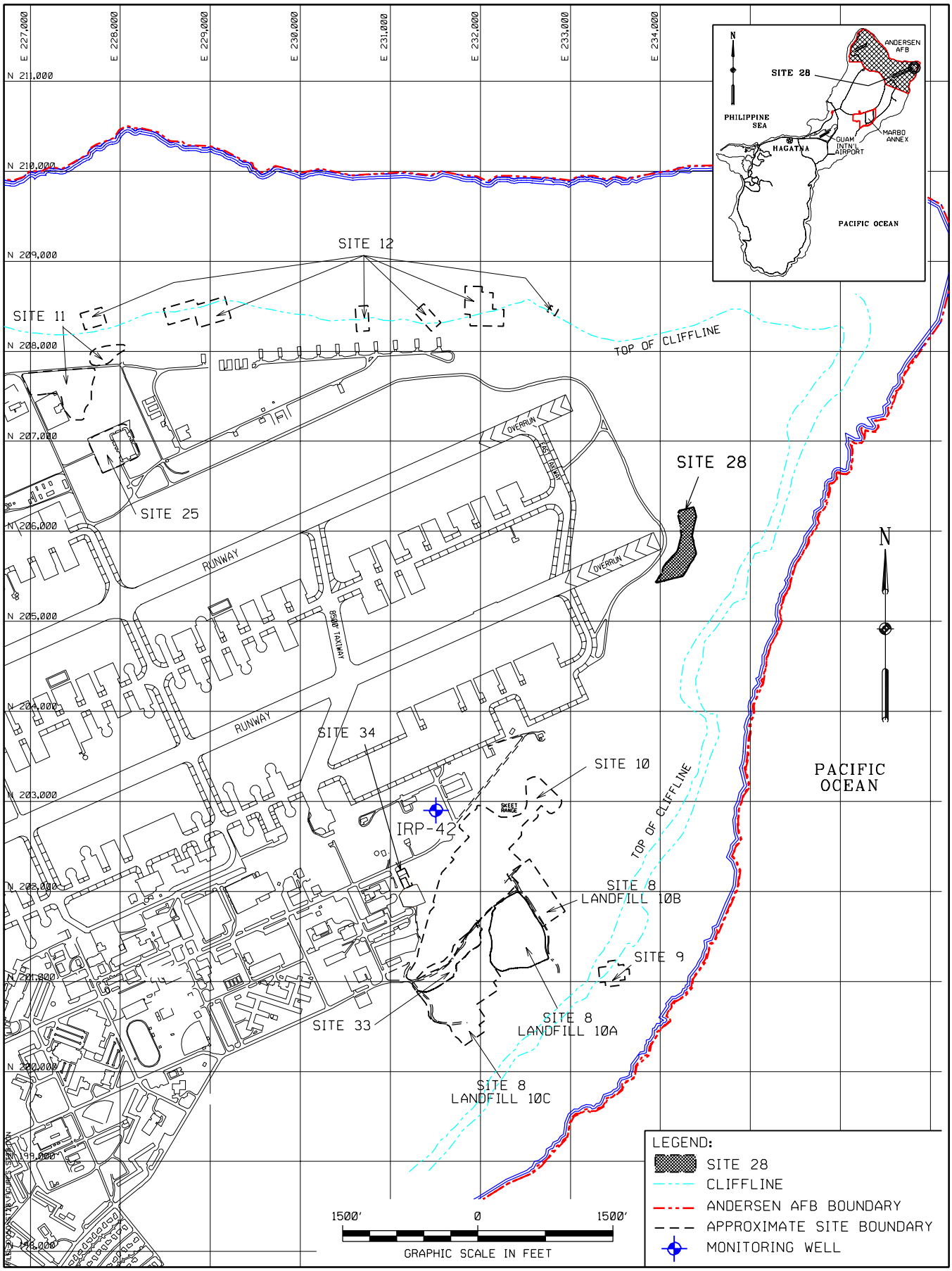


Figure 2-4. Location Map of Site 28, Main Base, Andersen AFB, Guam.

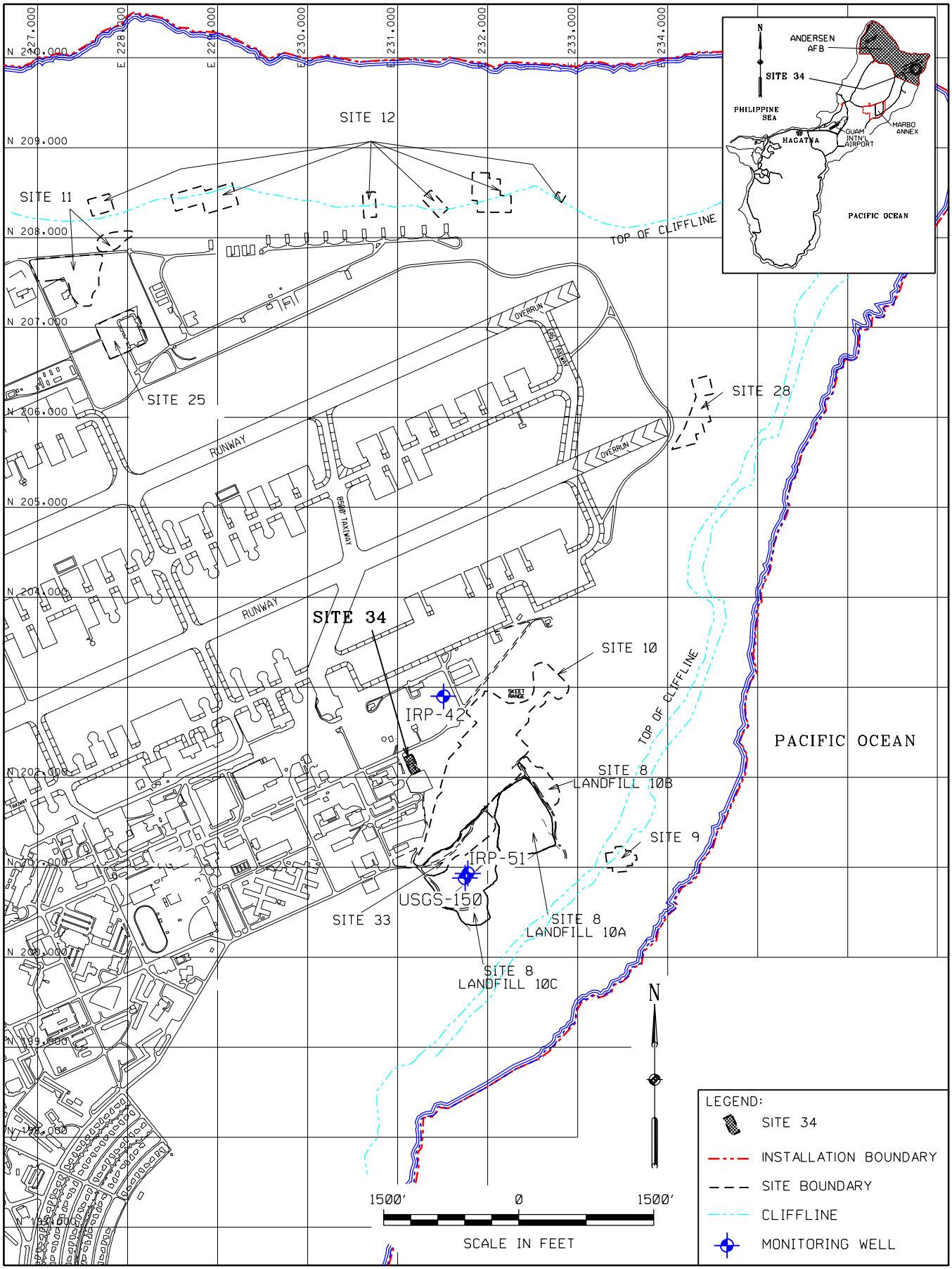


Figure 2-5. Location Map of Site 34, Main Base, Andersen AFB, Guam.

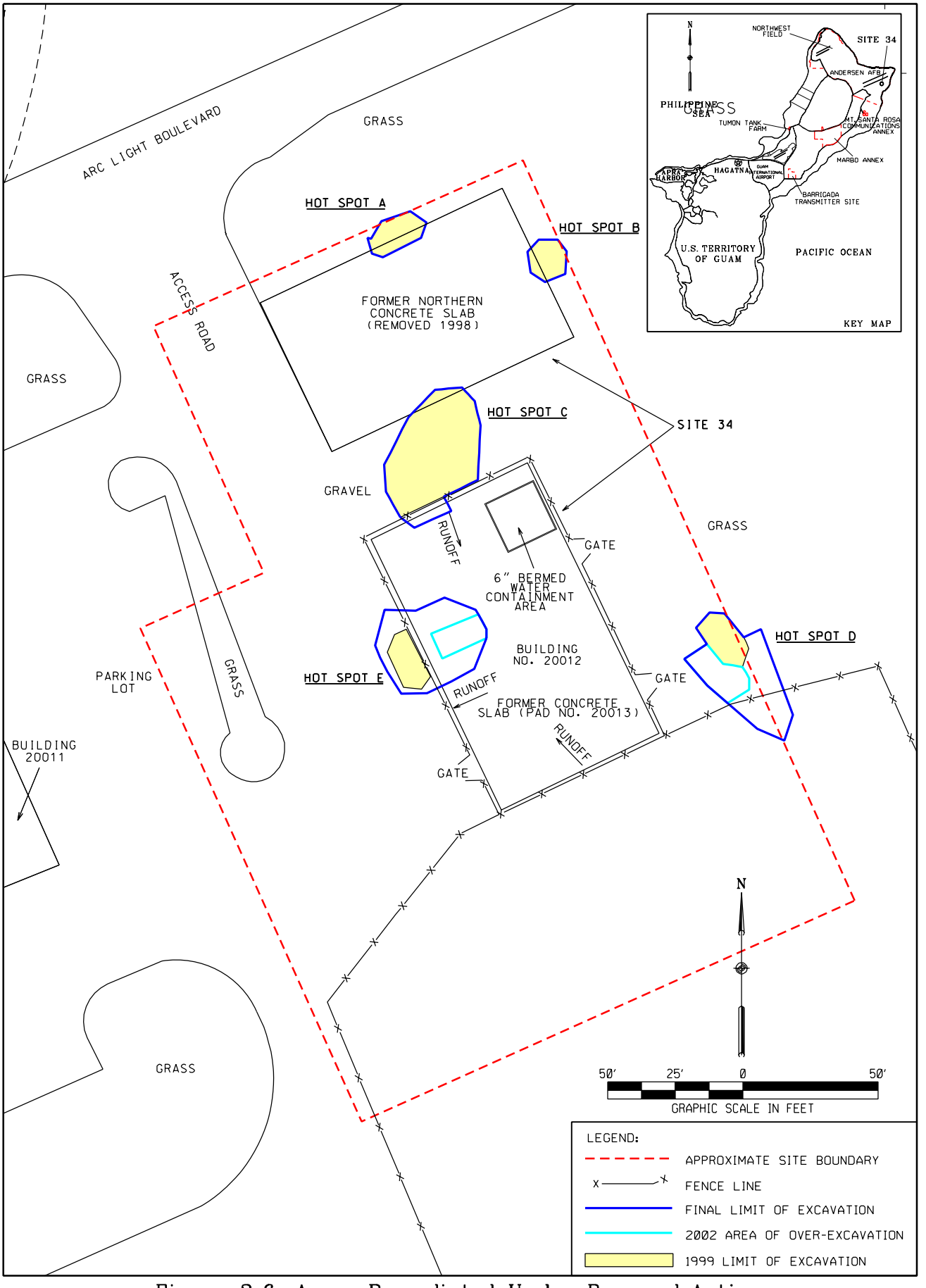


Figure 2-6. Areas Remediated Under Removal Action at Site 34, Andersen AFB, Guam.

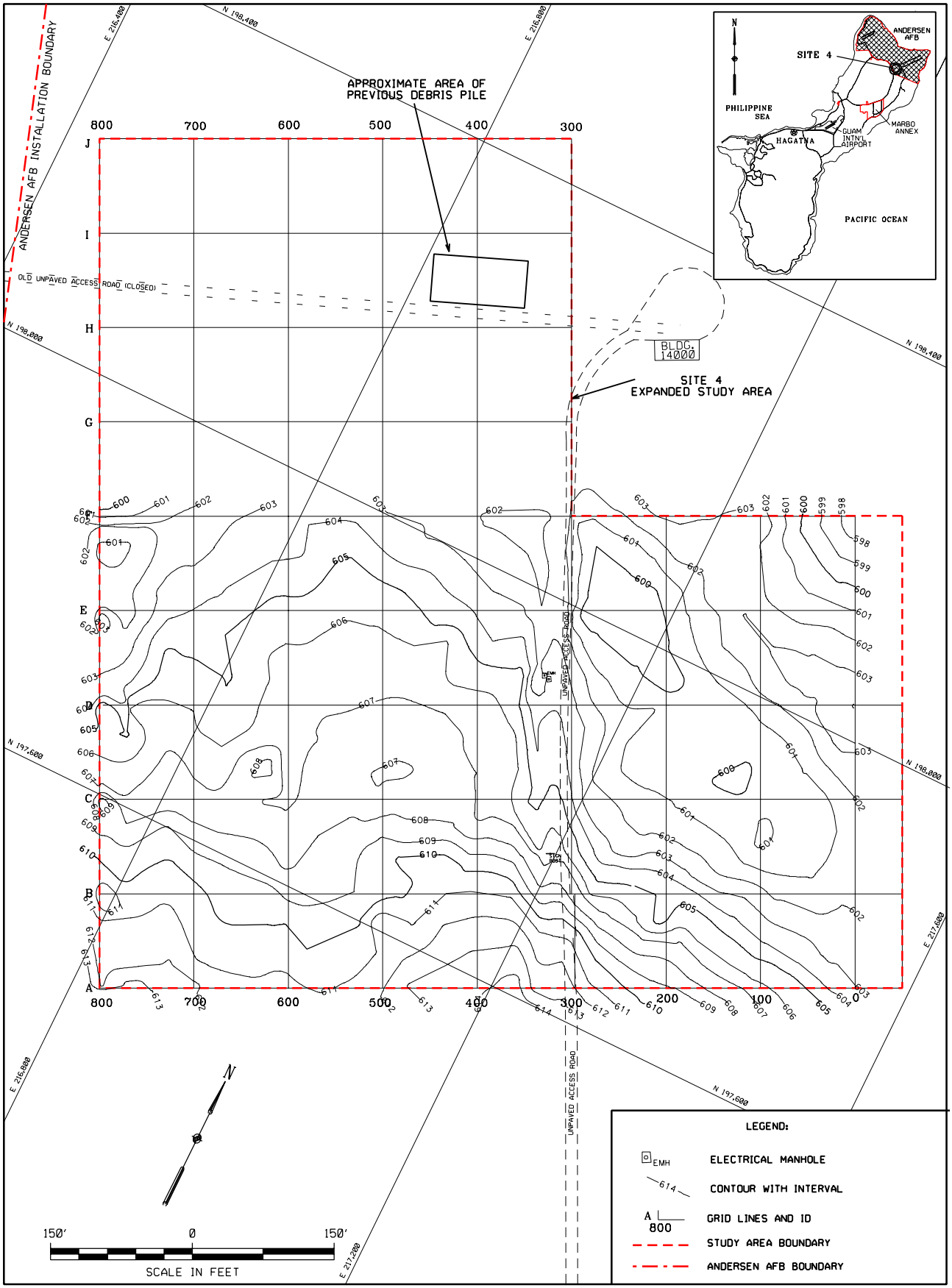


Figure 2-7. Surface Topography at Site 4, Andersen AFB, Guam.

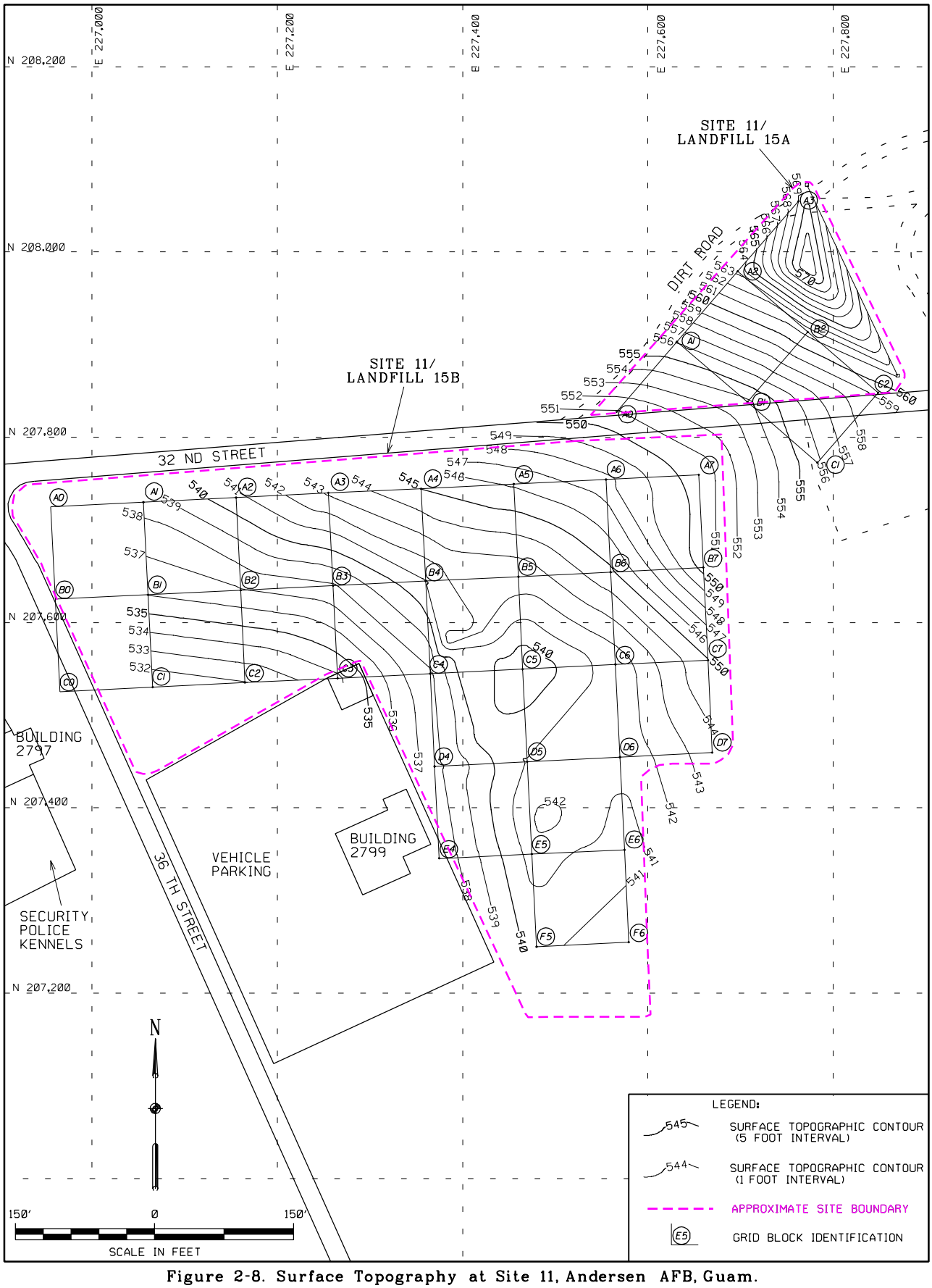


Figure 2-8. Surface Topography at Site 11, Andersen AFB, Guam.

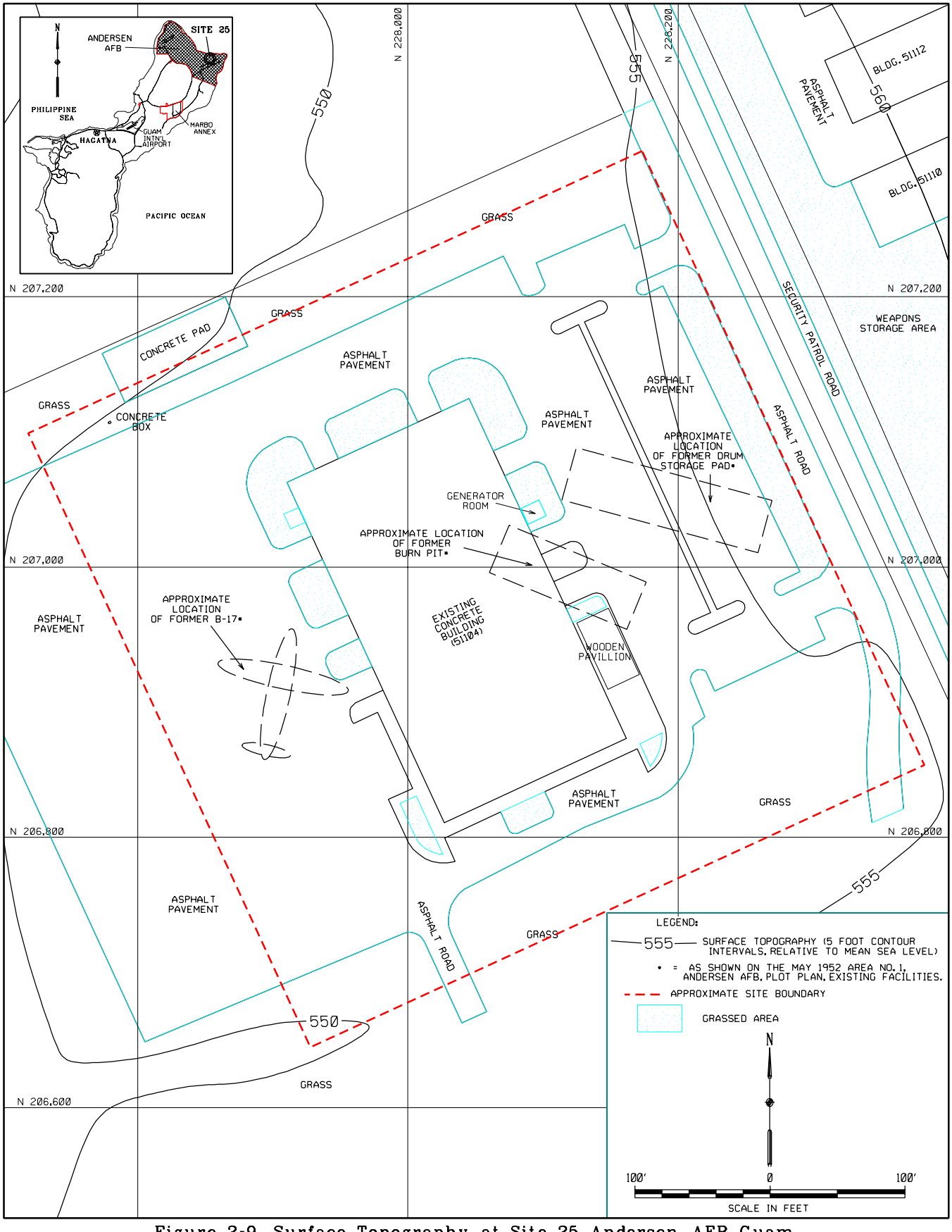


Figure 2-9. Surface Topography at Site 25, Andersen AFB, Guam.

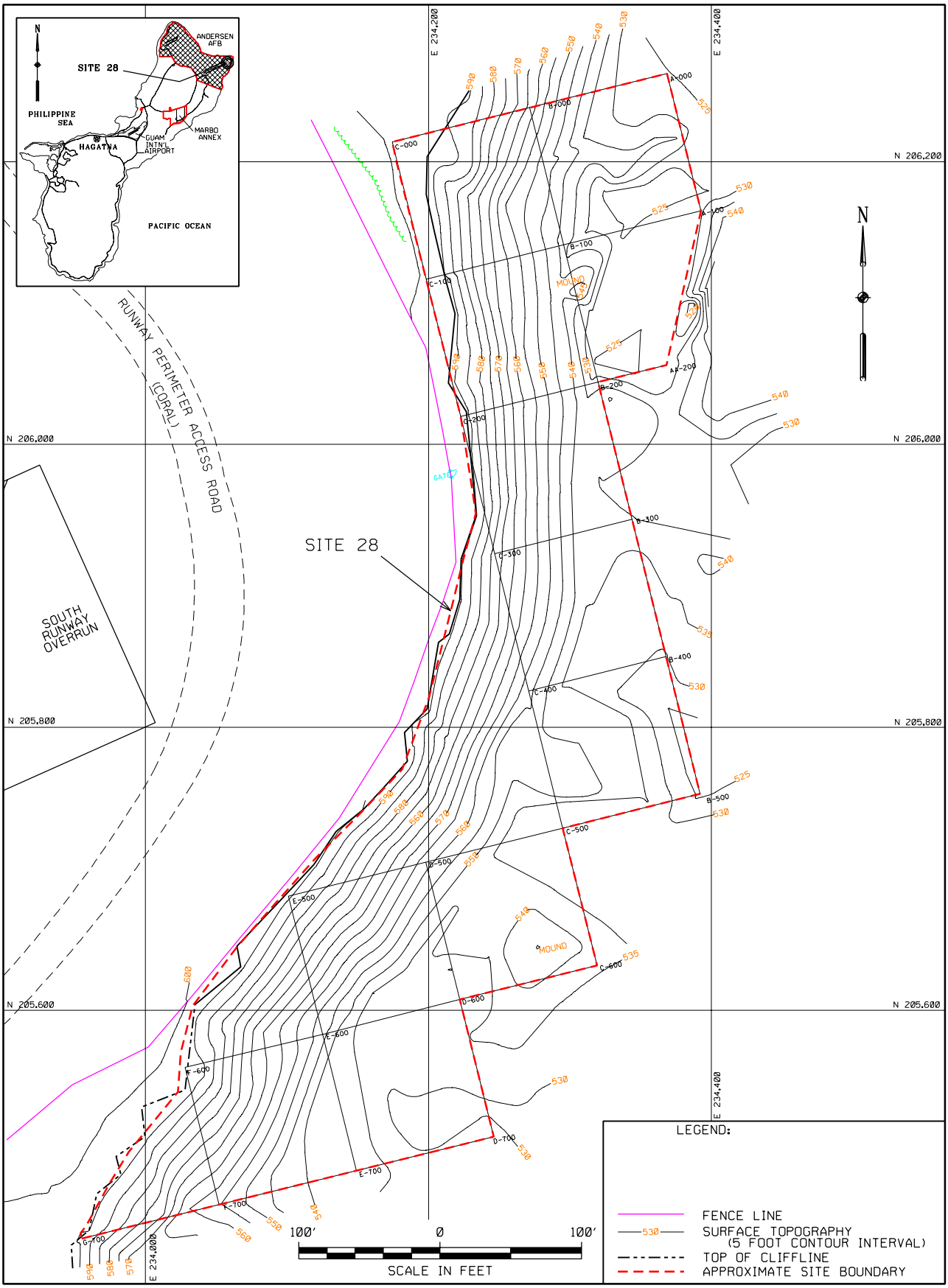


Figure 2-10. Surface Topography at Site 28, Andersen AFB, Guam.

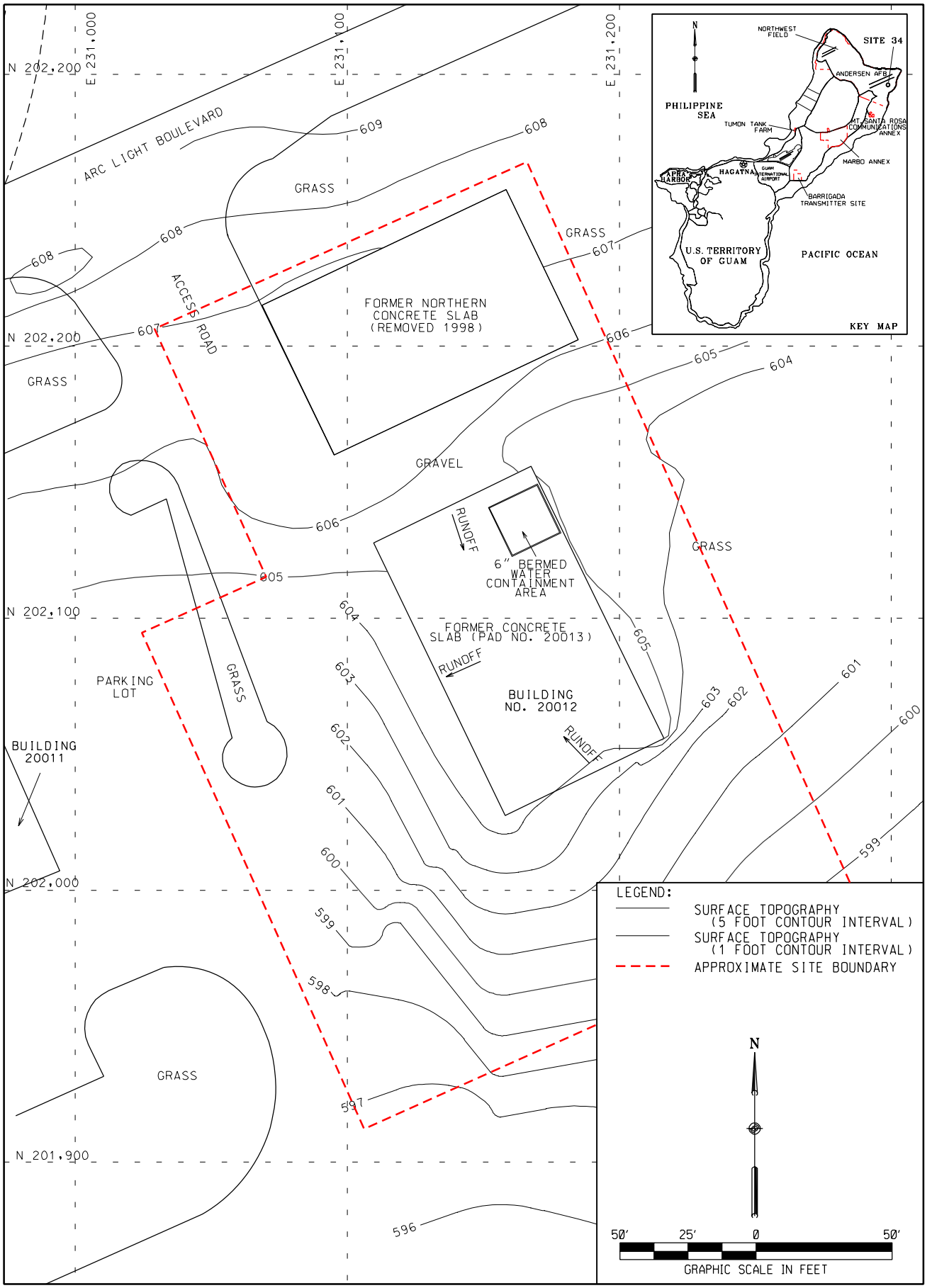


Figure 2-11. Surface Topography at Site 34, Andersen AFB, Guam.

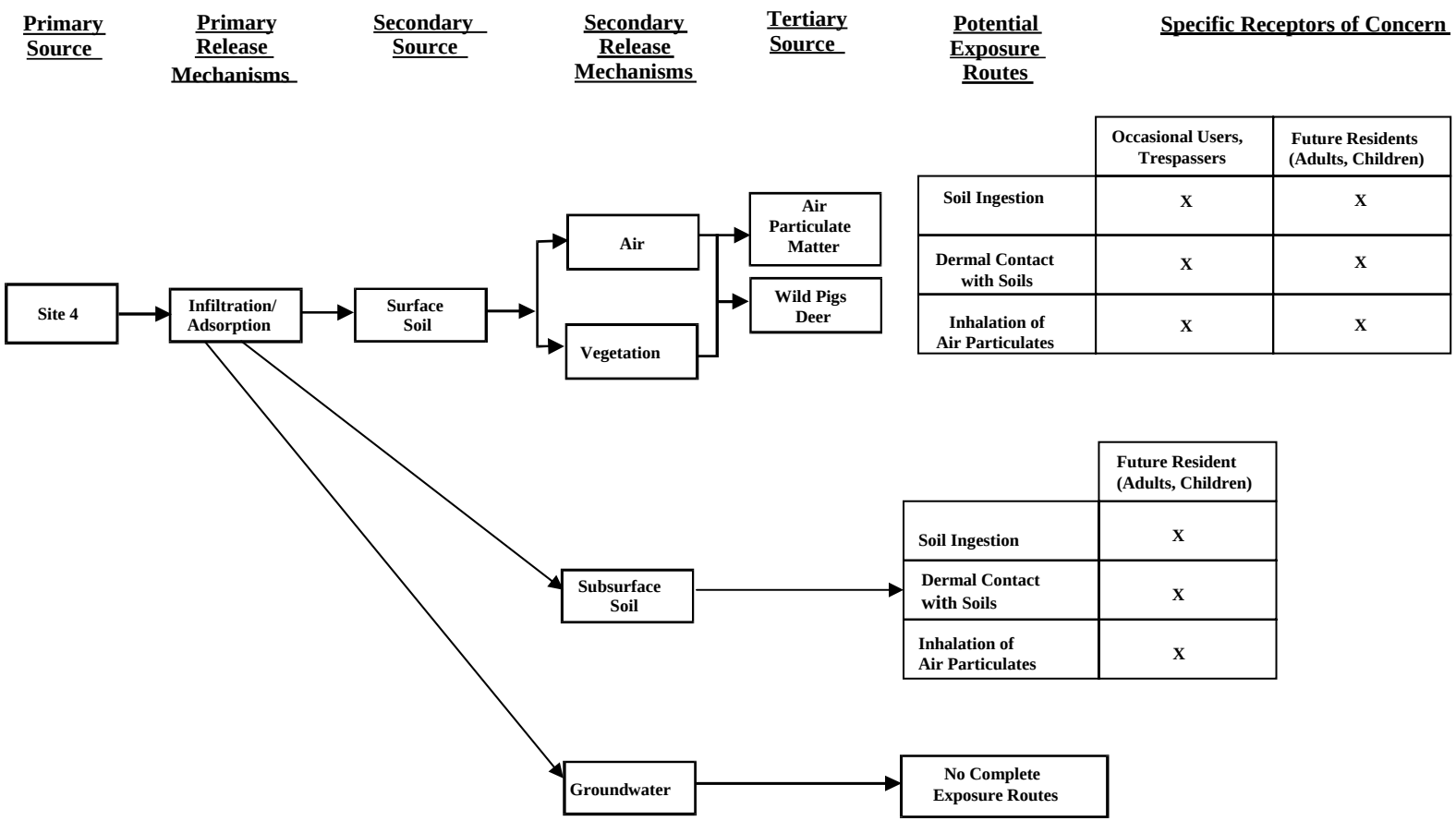


Figure 2-12. Human Health Risk Assessment Conceptual Site Model for Site 4, Andersen AFB, Guam.

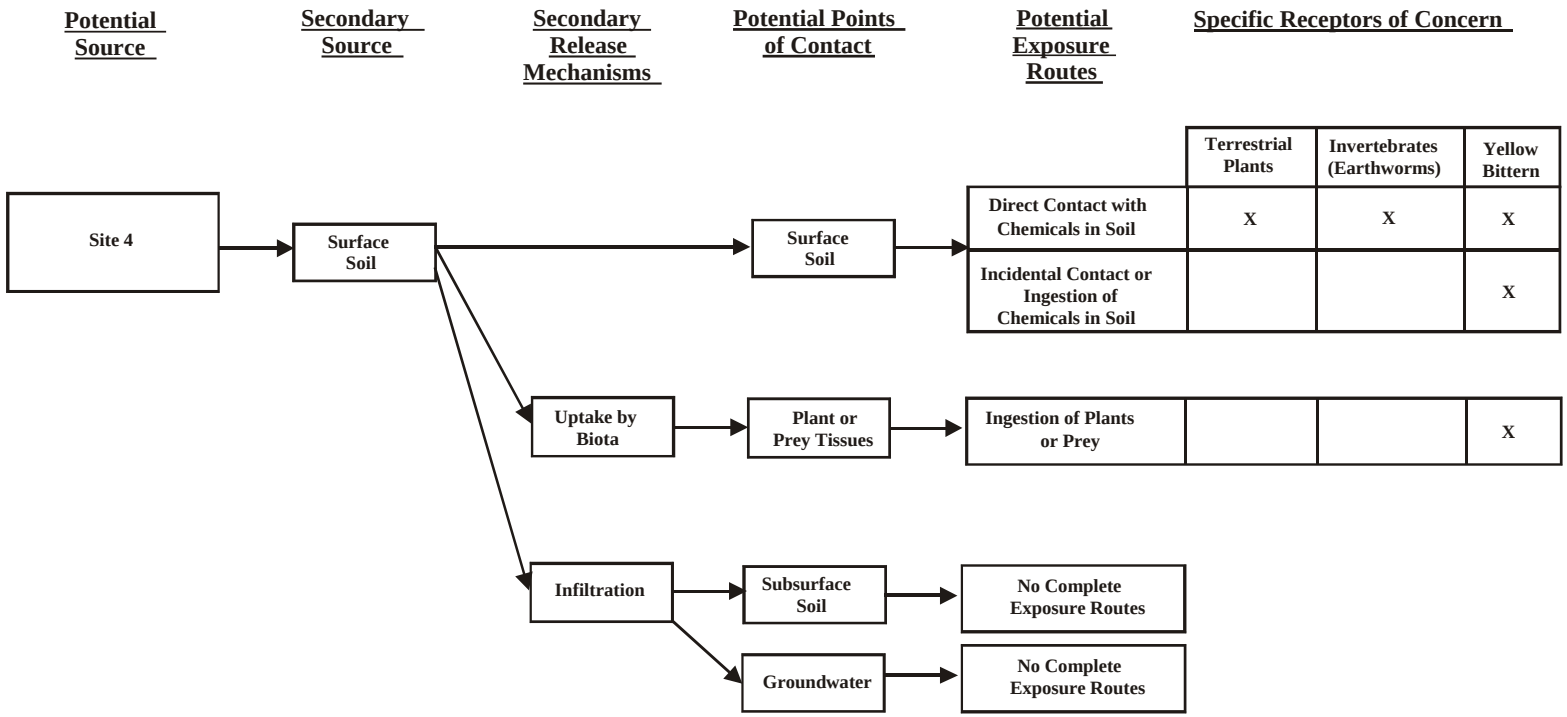


Figure 2-13. Ecological Risk Assessment Conceptual Site Model for Site 4, Andersen AFB, Guam.

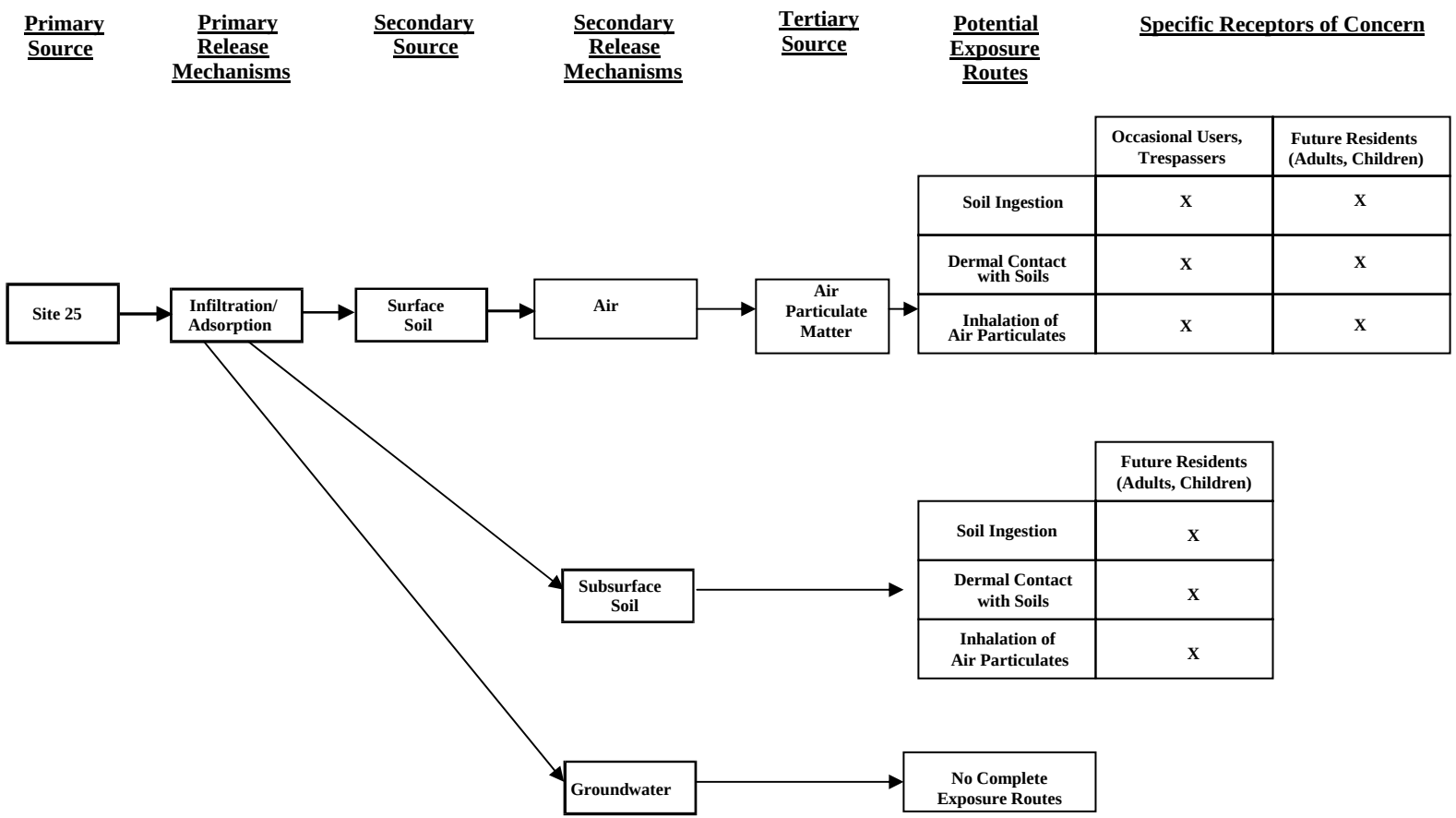
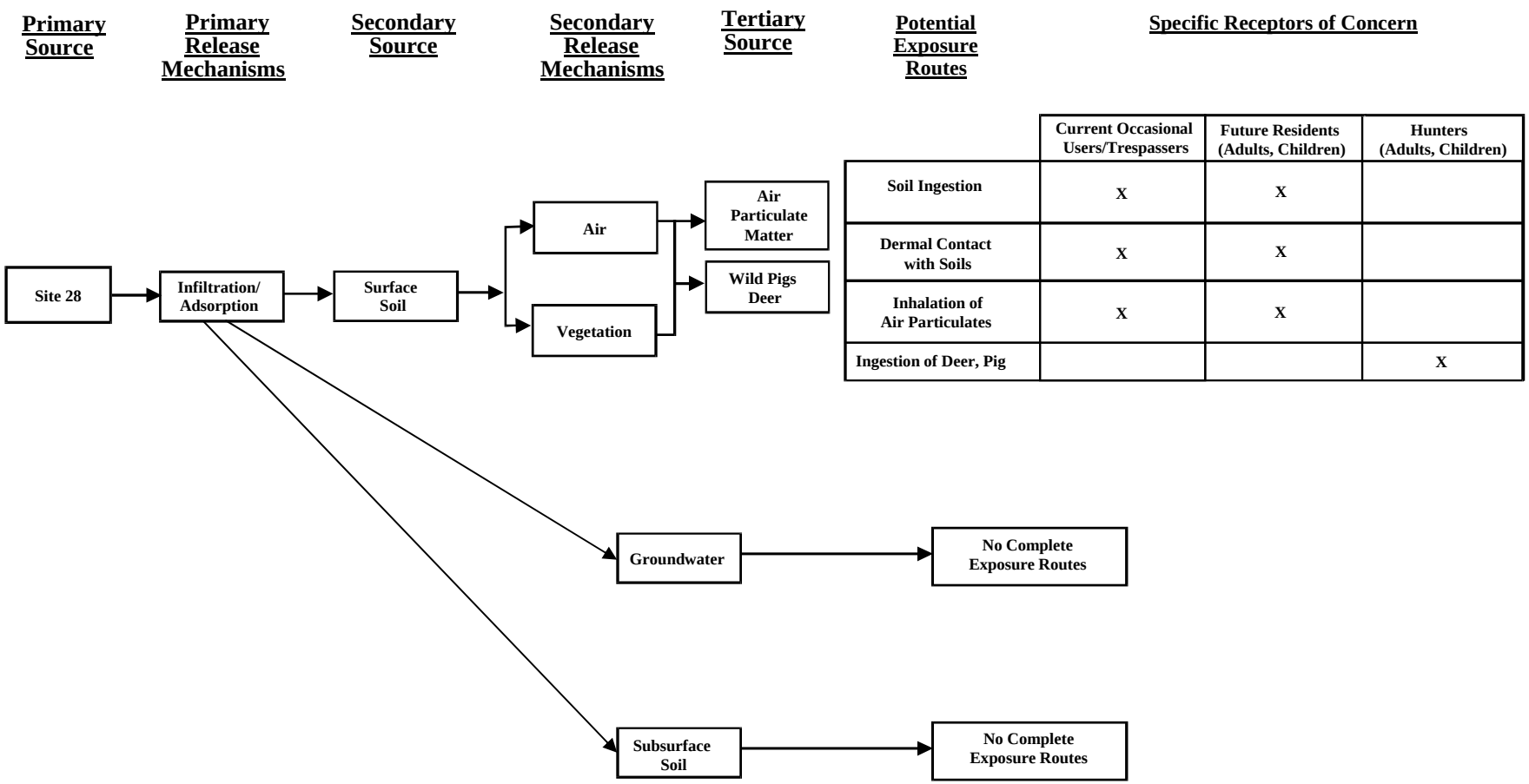


Figure 2-14. Human Health Risk Assessment Conceptual Site Model for Site 25, Andersen AFB, Guam.



	Current Occasional Users/Trespassers	Future Residents (Adults, Children)	Hunters (Adults, Children)
Soil Ingestion	X	X	
Dermal Contact with Soils	X	X	
Inhalation of Air Particulates	X	X	
Ingestion of Deer, Pig			X

Figure 2-15. Human Health Risk Assessment Conceptual Site Model for Site 28, Andersen AFB, Guam.

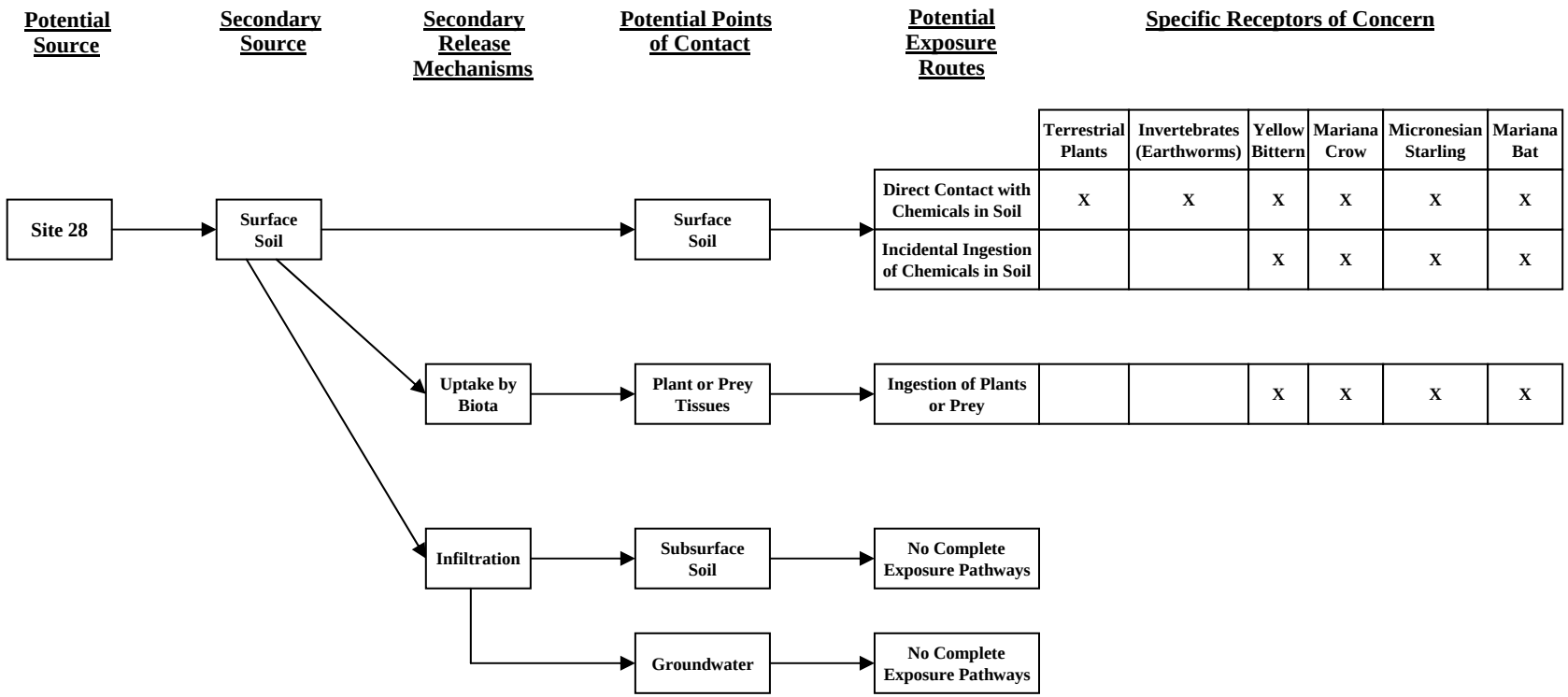


Figure 2-16. Ecological Risk Assessment Conceptual Site Model for Site 28, Andersen AFB, Guam.

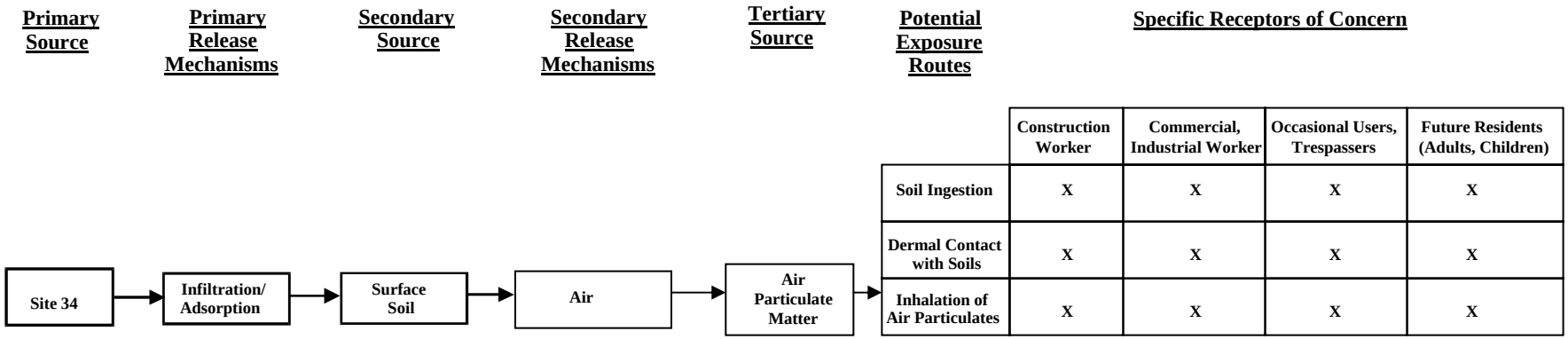


Figure 2-17. Human Health Risk Assessment Conceptual Site Model for Site 34, Andersen AFB, Guam.

APPENDIX A

UNCERTAINTIES ASSESSMENT FOR HUMAN HEALTH RISK ASSESSMENT

1.0 UNCERTAINTIES ASSESSMENT FOR HUMAN HEALTH RISK ASSESSMENT

1.1 Sampling and Analysis Uncertainties

The sampling plan can have a significant impact on the results obtained in calculating human health risks at a site. To the extent that samples are collected in areas that are expected to be contaminated (biased sampling), the exposure point concentration (EPC) used in calculating risk exposures and risks is likely to overestimate the actual concentration encountered at the site from random exposure across the site. This sampling bias will generally result in an overestimate of exposures and risks at a site.

The soil sampling at the site incorporated a combination of random and biased samples. As the majority of soil samples collected at the site were biased toward potentially contaminated areas, the detected concentrations and calculated health risks would tend to be overestimated.

1.2 Chemical Fate and Transport Modeling Uncertainties

The models used to estimate chemical concentrations associated with particulates in air at the site are consistent with those recommended by the U.S. Environmental Protection Agency (USEPA) (1996a). However, due to uncertainties in modeling methodologies, USEPA-recommended models are likely to overestimate actual concentrations at the site. Thus, use of models is likely to result in overestimates of health risks at the site.

1.3 Uncertainties Analysis of Exposure Assessment

An analysis of uncertainties is an important aspect of the exposure assessment. It provides the risk assessor and reviewer with information relevant to the individual uncertainties associated with exposure factor assumptions and their potential impact on the final assessment.

1.3.1 Exposure Point Concentrations

A significant uncertainty exists with the basic approach used in arriving at EPC for the contaminants of potential concern (COPCs) in surface soils. Specifically, an objective of the guidance is to include some quantitative value for COPCs when analytical data indicate that those COPCs were not detected, so that an estimated potential intake and resultant potential risk can be calculated. Based on the approach referenced in *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual (Part A)* (USEPA, 1989), values reported as nondetects were assigned a value of one-half of the instrument detection limit (IDL). However, this approach generally overestimates the average value, and results in overestimates of intakes and subsequent risks, particularly for COPCs with low frequencies of detection.

1.3.2 Exposure Factors

Soil Ingestion Rate

Soil ingestion rates for children are based on studies performed by Binder et al. (1986) and Clausing et al. (1987). Methods used in both studies involved the measurement of trace elements found in soil, and known to be poorly absorbed by the gut, in soils and the feces of children. Both were short-term studies, and as they were not based on average long-term exposures, they represent an overestimate of exposure. More recent published data have shown that the average soil ingestion rate for a two-year-old is less than 100 milligrams per day (mg/day) (Calabrese, 1989; Davis, 1990). Furthermore, USEPA soil ingestion rates for children ages 1–6 are based on ingestion rates for children at age 18 months and are applied through age 6 years (USEPA, 1996a). This is very unlikely because children over 2 years old do not ingest at the same rate as an 18 month old. Additionally, a conservative estimate was used for the fraction ingested (FI value of 1.0), which assumes that all soil ingested (for residential exposures) is ingested at the residence. This assumes that no activities take place elsewhere. Taken together, these suggest that intakes for this pathway are overestimated.

Exposure Duration

USEPA assumes residential exposure duration (ED) for adults is 30 years, which represents the USEPA-derived 90th percentile upper limit for time spent at one residence. The average (50th percentile) time spent at one residence is seven years. These values are recommended in the Supplemental Guidance to *Risk Assessment Guidance for Superfund* (USEPA, 1996a). Soil ingestion for children age 1–6 is assumed to continue for the entire six-year time frame.

1.3.3 Lead Uptake Model Exposure Uncertainties

Some of the uncertainties in exposure estimates presented by the USEPA Integrated Exposure Uptake Biokinetic Model (IEUBK) Lead Uptake/ Biokinetic Model include assumptions regarding indoor dust levels and indoor/outdoor exposure frequencies. However, there are numerous additional assumptions used in the IEUBK Model which have limited supporting scientific data, but which have major impacts on overall estimate of lead uptake.

> *"The greatest source of uncertainty in the prediction of lead uptake from dust and soil is the estimate of gastrointestinal absorption of lead. In vitro studies have shown that the lead in dust and soil is solubilized in acidic solutions similar to that found in the stomach; however, in alkaline solutions, similar to intestinal fluids, lead can remain bound to soil…"*
>
> *"The issue of bioavailability of lead for soil is a major source of uncertainty in the IEUBK Model and merits further investigation"* (Taken from Section 3.3.3.3 of the Technical Support Document on Lead, USEPA, 1990).
>
> Furthermore, *"A review of mining studies indicates that there is not a strong correlation between soil lead and blood lead, that there are no elevated blood lead concentrations in*

areas with very high soil lead concentrations, and that the cancer slopes for mining sites are considerably lower than those for urban or smelter sites." (Taken from Section 3.4.2 of the Technical Support Document on Lead, USEPA, 1990).

These observations question the value of this model in predicting exposures (uptake) from lead in soil and dust. For the purposes of the human health risk assessment (HHRA), the model has been run using the USEPA-derived default value for gastrointestinal (GI) absorption of lead in soil, which is 0.30. This default value is not well supported in the scientific literature. It was derived from animal studies of lead absorption from water, which are expected to vary considerably from absorption of lead bound in a soil matrix. Data from blood lead level and soil lead level studies suggest that lead in soils is not bioavailable at concentrations below 500–1,000 parts per million (ppm).

1.4 Uncertainties of Toxicity Assessment

Numerous uncertainties are associated with the Toxicity Assessment. These are generally due to the unavailability of data to thoroughly calculate the toxicity of COPCs. These are described in more detail in the following sections.

1.4.1 Uncertainties Associated with Non-carcinogenic Effects

Interspecies Extrapolation

The majority of toxicological information comes from experiments with laboratory animals. Experimental animal data have been relied on by regulatory agencies to assess the hazards of human chemical exposures. Interspecies differences in chemical absorption, metabolism, excretion, and toxic response are not well understood; therefore, conservative assumptions are applied to animal data when extrapolating to humans. These probably result in an overestimation of toxicity.

Intraspecies Extrapolation

Differences in individual human susceptibilities to the effects of chemical exposures may be caused by such variables as genetic factors (e.g., glucose-6-phosphate dehydrogenase deficiency), lifestyle (e.g., cigarette smoking and alcohol consumption), age, hormonal status (e.g., pregnancy), and disease. To take into account the diversity of human populations and their differing susceptibilities to chemically induced injury or disease, a safety factor is used. USEPA uses a factor between 1 and 10. This uncertainty may lead to overestimates of human health effects at given doses.

Exposure Routes

When experimental data available on one route of administration are different from the actual route of exposure that is of interest, route-to-route extrapolation must be performed before the risk can be assessed. Several criteria must be satisfied before route-to-route extrapolation can be undertaken. The most critical assumption is that a chemical injures the same organ(s) regardless

of route, even though the injury can vary in degree. Another assumption is that the behavior of a substance in the body is similar by all routes of contact. This may not be the case when, for example, materials absorbed via the gastrointestinal tract pass through the liver prior to reaching the systemic circulation, whereas by inhalation the same chemical will reach other organs before the liver. However, when data are limited these extrapolations are made, and may result in overestimates of human toxicity.

1.4.2 Uncertainties Associated with Carcinogenic Effects

Interspecies Extrapolation

The majority of toxicological information for carcinogenic assessments comes from experiments with laboratory animals. There is uncertainty about whether animal carcinogens are also carcinogenic in humans. While many chemical substances are carcinogenic in one or more animal species, only a very small number of chemical substances are known to be human carcinogens. The fact that some chemicals are carcinogenic in some animal species but not in others raises the possibility that not all animal carcinogens are human carcinogens. Regulatory agencies assume that humans are as sensitive to carcinogens as the most sensitive animal species. This policy decision, designed to prevent underestimation of risk, introduces the potential to overestimate carcinogenic risk.

High-Dose to Low-Dose Extrapolation

Typical cancer bioassays provide limited low-dose data on responses in experimental animals for chemicals being assessed for carcinogenic or chronic effects. The usual dose regime involves three dose groups per assay. The first dose group is given the highest dose that can be tolerated, the second is exposed to one-half that dose, and the third group is unexposed (control group) (National Research Council [NRC], 1983). Because this dosing method does not reflect how animals would react to much lower doses of a chemical, a dose-response assessment normally requires extrapolation from high to low doses using mathematical modeling that incorporates, to varying degrees, information about physiologic processes in the body (NRC, 1983).

A central problem with the low-dose extrapolation models is that they all too often fit the data from animal bioassays equally well, and it is not possible to determine their validity based on goodness of fit. Several models may fit experimental data equally well, but they may not all be equally plausible biologically. The dose-response curves derived from different models diverge substantially in the dose range of interest (NRC, 1983). Therefore, low-dose extrapolation is more than a curve-fitting process, and considerations of biological plausibility of the models must be taken into account before choosing the best model for a particular set of data.

1.4.3 Site-Specific Uncertainties

Risk estimations necessitate modeling hypothetical scenarios that may in fact never occur, resulting in the quantification of potential risks that are actually nonexistent. For example, in the Main Base OU HHRAs, there are currently no current resident populations at or in the vicinity of the sites. Although it is extremely unlikely that there will be residential development in these

areas of Andersen Air Force Base in the future, the residential exposure scenarios were evaluated in the HHRAs as a conservative measure.

Additional site-specific uncertainties related to exposure assessment are associated with the presence of high background concentrations of certain metals (arsenic and manganese) in surface soils of Guam. Because these metals are naturally present in surface soils at concentrations of potential concern to human health, there is uncertainty associated with discerning health risks posed by potential onsite contamination.

Site-related uncertainties for Site 28 summarized below.

Site 28

Additional uncertainties are added to the risk assessment process for Site 28 due to the nature of the contaminants that are driving the potential cancer and non-cancer risks under the specified conditions of exposure.

Lead – There are currently no USEPA-published toxicity values for lead that can be used in assessing human health risks associated with lead exposure. The use of the USEPA IEUBK model introduces many uncertainties into the assessment of lead exposures. The toxic endpoints considered in these models are primarily neurological effects on children at blood lead levels greater than 10 μg/dL, and elevated blood pressure in adult males. These effects are serious, but the level in blood at which they are reached is still uncertain. Additional uncertainties exist with the assumptions used in the models that are used to predict blood lead levels from environmental exposures. These factors are likely to overestimate exposures and risks calculated for lead at this site.

1.5 Uncertainties in Risk Characterization

Uncertainties in the risk characterization can stem from the inherent uncertainties in the data evaluation; the exposure assessment process, including any modeling of EPCs in secondary media from primary media; and the toxicity assessment process. The individual uncertainties in these respective processes were addressed in the previous sections.

Uncertainties associated with the probability of adverse impacts to human health can also be evaluated by examining the relative risk estimated for Average Exposure and upper bound Reasonable Maximum Exposure conditions. This type of simple probability analysis is often useful to risk managers who must balance baseline risk estimates with the expected costs and benefits of remedial activities.

2.0 REFERENCES

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APPENDIX B

NOTICE OF PUBLIC MEETING

EA Engineering, Science and Technology, Inc.

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Yigo, Guam 96929-4355
Telephone: 671-366-5231
Fax: 671-366-3902

Major Mark Richter
Project Manager/COR
AFCEE
Unit 14007
APO AP 96543-4007

10 April 2008

SUBJECT: Final Record of Decision for Sites 4, 11, 25, 28, and 34, Main Base Operable Unit, Andersen Air Force Base, Guam.

PROJECT: Andersen AFB, Contract No. F41624-03-D-8596-0037 (Task Order 37)
Project No. AJJY20057001S4 (CDRL A001)

Dear Major Richter:

Enclosed is one (1) electronic copy of the *Final Record of Decision for Sites 4, 11, 25, 28, and 34, Main Base Operable Unit, Andersen Air Force Base, Guam.* This document was prepared in accordance with the Statement of Work for the above referenced task order. One (1) electronic copy for Ms. Cathy Dolan and one (1) electronic copy for Mr. Brian Thomas are being forwarded to Booz Allen Hamilton. Seven (7) copies for Andersen AFB (including two (2) copies for the information repositories and one (1) copy for the administrative record) are being hand-delivered to Mr. Gregg Ikehara. Two (2) copies of the completed signature pages for USEPA and two (2) copies of the completed signature pages for Guam EPA are being hand-delivered to Mr. Gregg Ikehara. A copy of this transmittal (w/o enclosures) will also be forwarded to AFCEE/MSCD.

If you have any questions or comments, please contact me at your convenience. We appreciate the opportunity to provide these services to AFCEE.

Sincerely,

for

Joel J. Lazzeri, P.G.
V.P. Federal Programs

cc: Mr. Gregg Ikehara, 36 CES/CEVR, Andersen AFB (7 copies)
Ms. Cathy Dolan, Booz Allen Hamilton (1 electronic copy)
Mr. Brian Thomas, Booz Allen Hamilton (1 electronic copy)
Mr. Mark Ripperda, USEPA Region 9 (2 copies signature page only)
Mr. Michael Cruz, Guam EPA (2 copies signature page only)
Mr. Scott Moncrief, P.G., EA–Hawaii (1 electronic copy)
Mr. Joel Lazzeri, P.G., EA–Corporate (1 electronic copy)
Mr. Toraj Ghofrani, P.E., EA–Guam (1 electronic copy)
AFCEE/MSCD (w/o enclosures)
AFCEE Project File, EA-Guam (1 electronic copy)

Responses to Technical Review Comments
for
Records of Decision
for
Northwest Field (Sites 7, 16, 17, 21, 30, 31, and 36) and
Group 3 (Sites 4, 11, 25, 28, and 34)
ANDERSEN AIR FORCE BASE, GUAM
EA Engineering Science and Technology
April and May 2007

Item	Page	Section	Comments	Response to Comments
Comments provided by Mark Ripperda on 18 July 2007				
Comments Pertaining to both RODs				
1	1-1	1.2	Page 1-1 of the Declaration should be reworded to reflect that the Air Force and EPA have jointly selected the remedy and that Guam EPA has concurred with the decision. Although we have not always done so consistently in the past, we have been trying to use such language in accordance with Section 120(e)(4).	Text has been revised as follows: The USAF and the United States Environmental Protection Agency (USEPA) have jointly selected the remedies and the Guam Environmental Protection Agency (Guam EPA) has concurred with the decision, under the guidelines established in the Federal Facilities Agreement (FFA) signed in February 1993 by representatives of USEPA Region 9, Guam EPA, and the USAF (USEPA et al., 1993).
2	2-3 and 2-4	2.2	Page 2-3 (ROD for Sites 4,11,25,28, and 34) and page 2-4 (ROD for sites 7,16,17,21,30,31, and 36) -- the following sentence should be slightly reworded as shown in redline and strikeout: "The FFA was based on applicable environmental laws, including ~~the~~ CERCLA, Hazardous and Solid Waste Act of 1982, SARA, and **the** NCP."	Comment acknowledged. Text has been revised as stated.
3		General	The term IRA is used at various points in both documents to describe removal actions taken to address certain risks. However, the definitions section of the document defines IRA as "Interim Remedial Action". The definition should be changed to "Removal Action" in both documents, including in any tables where the term is used, e.g., the table on p. 2-22 in the ROD for Sites 4, 11, etc.	Comment acknowledged. Text has been revised as stated.

Item	Page	Section	Comments	Response to Comments
Comments Pertaining to ROD for Sites, 4, 11, 25, 28, and 34				
1	2-31	2.7.3.2	To complete the thought, should we add a sentence at the end of that paragraph, as follows: "Therefore, no ERA was conducted for Site 25."	Comment acknowledged. Text has been revised as stated.
2	2-33 to 2-39 and Tables 2-3 to 2-6	Section 2.7.5	The HHRA section for Site 34 is confusing because it presents the data and risk that existed prior to the removal action. Please remove all of these tables and most of the text. Please simply state the risk that existed prior to the removal action and that the removal was successful in achieving the remedial goals, which were set at the PRGs (I believe that's what they were). Thus, no unacceptable risk currently exists. Also, per the earlier comment, replace the term IRA with removal action.	Comment acknowledged. All relevant tables have been removed. Text has been revised to briefly summarize the unacceptable risks that existed prior to the removal action (RA) and clearly state that the RA achieved the cleanup goals, effectively reducing site risks to acceptable levels. The term IRA has been replaced globally with RA.
Comments Specific to ROD for Site 7, 16, 17, 21, 30, 31, and 36				
1		General	At various points the ROD (see e.g., pp 1-2, 2-49 and 50, and 2-62) indicates that MEC present at Site 30 will be addressed under the MMRP. Thus "no action" is really not an appropriate remedy selection for Site 30. The cleanest fix to this would be to delete Site 30 from this No Action ROD and deal with all issues relating to Site 30 in a later ROD. If we don't do it that way, then each time the ROD discusses the selected remedy for Site 30 it would need to clarify that the no action determination is only for hazardous substances other than MEC and that a further ROD will make a remedy selection with respect to MEC. I don't think that is as satisfactory a way to deal with the issue as deleting Site 30 from this ROD would be.	Comment acknowledged. Site 30 has been removed from the ROD. Site 30 will be administratively transferred to Andersen AFB's Military Munitions Response Program. A final ROD for Site 30 will be prepared under the MMRP that will document the final remedy with respect to MEC.

Item	Page	Section	Comments	Response to Comments
2			Risk Assessments for Sites 16, 31 and 36. Similar to the comment for Site 34, please remove most of the risk assessment data and analysis from the document. The ROD should only state the risk that existed pre-removal and the current risk. If the current risk wasn't calculated, state that the removals achieved the cleanup goals of PRGs or background.	Comment acknowledged. All relevant tables have been removed. The Risk Assessment sections for Sites 16, 31, and 36 have been revised to briefly summarize the risk that existed prior to the RA and clearly state that the RA achieved cleanup goals, effectively reducing risks to acceptable levels.
3	General		My understanding is that Site 17 did have some MEC but the Air Force concluded that the MEC consisted of munitions that were properly disarmed, with no potential for detonation, i.e., it was not UXO (see p. 2-2). Shouldn't this be mentioned in the discussion of the Human Health Risk Assessment for Site 17 in section 2.7.2.1 at p. 2-45? I don't see any mention of MEC in that section, which seems inconsistent with the discussion on p. 2-2.	Comment acknowledged. The HHRA for Site 17 has been appended as follows: "…manganese concentrations in subsurface soils at Site 17 represent naturally occurring background. Remediation of manganese is not recommended. Although Site 17 was reportedly used as a disposal site for MEC in the late 1950s through early 1960s, EOD personnel conducted a site visit in 1998 and determined that the MEC on site consisted of munitions that were properly disarmed, with no potential for detonation. Since no unacceptable risk to public health was identified at Site 17, no further action is proposed for this site and no FS is required."
Comments provided by Mark Ripperda on 22 August 2007				
Comments Pertaining to both RODs				
1			Risk assessment sections in both ROD documents do not adequately define what the cleanup goals were based on. Please define what the cleanup goals were (BTV, PRG, or other) in order to provide a quantitative statement regarding current risks present at the sites.	Comment acknowledged. Current site risk values, reflected in the clean-up goals met under the removal actions, were added to the Summary of Human Health Risk Assessments for Site 34 in the Group 3 ROD, and for Sites 16, 31, and 36 in the NWFOU ROD.
Comments provided by Chris Wright on 24 August 2007				
Comment Specific to ROD for Site 7, 16, 17, 21, 30, 31, and 36				
1			The NWF ROD should not have the signature block for Maj Gen Utterback.	Comment acknowledged. Signature block for Major General Utterback has been replaced with a signature block for Brigadier General Douglas H. Owens.